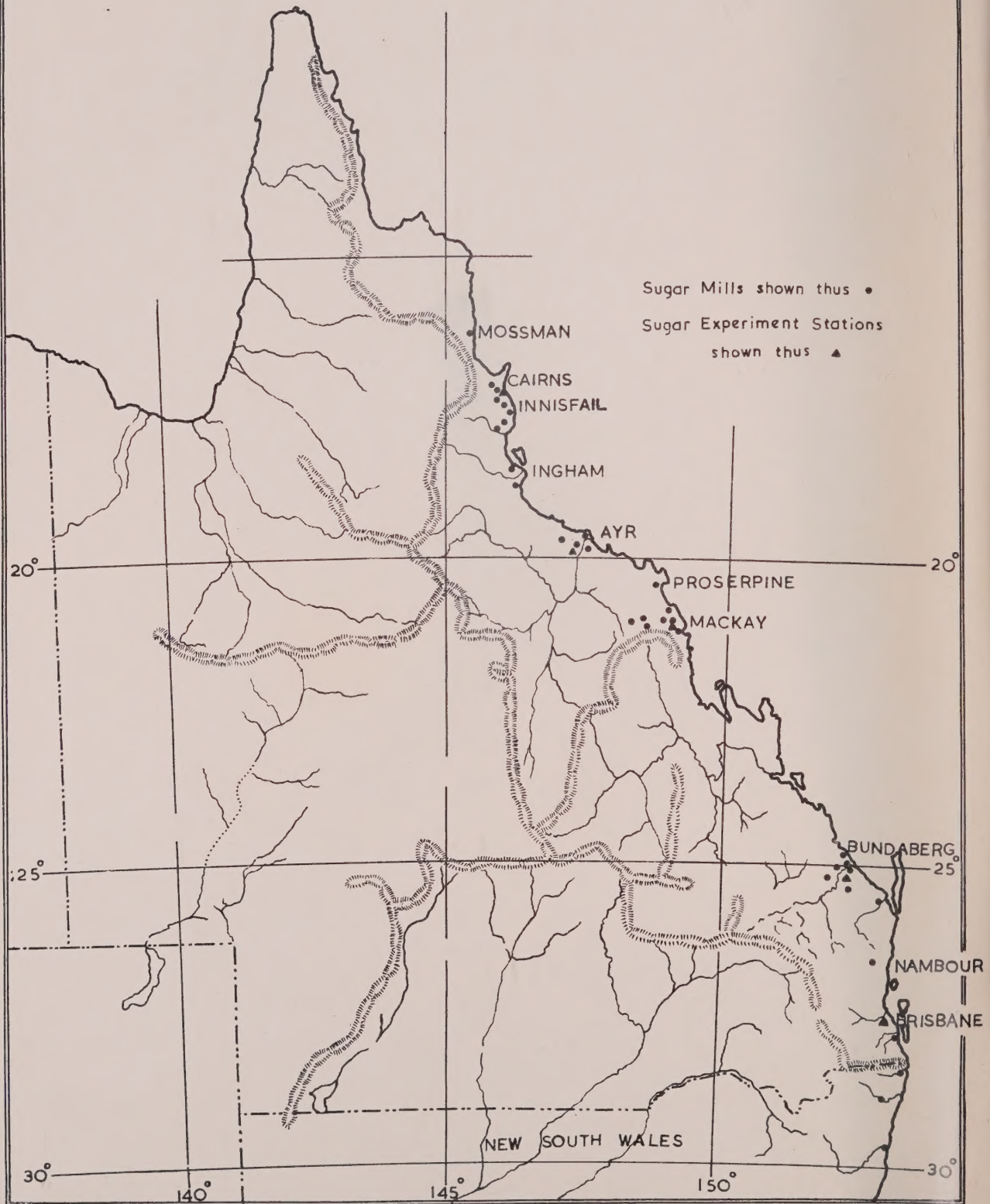


54th Annual Report
Bureau of Sugar
Experiment Stations



QUEENSLAND



1954

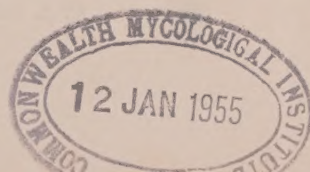
QUEENSLAND

FIFTY-FOURTH
ANNUAL REPORT OF THE BUREAU
OF SUGAR EXPERIMENT STATIONS

REPORT OF THE DIRECTOR
TO
THE HON. THE SECRETARY FOR AGRICULTURE AND STOCK

(As required by "The Sugar Experiment Stations Acts, 1900 to 1954")

BRISBANE



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Mr. A. F. BELL, Under Secretary for Agriculture and Stock, Deputy Chairman.
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J. L. CLAYTON, Chief Mill Technologist.	J. D. WATSON, Cadet Statistical Officer.
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N. G. GRAFF, Field Assistant.	E. A. PEMBROKE, Adviser.
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G. WILSON, Entomologist.	Miss P. L. GRIFFIN, Clerk-Typiste.

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S. O. SKINNER, Senior Adviser.	J. ANDERSON, Field Assistant.
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Ingham:

O. W. D. MYATT, Adviser.

Ayr:

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H. C. HASKEW, Asst. Agronomist.	B. G. ADKINS, Mill Technologist.
N. McD. SMITH, Adviser.	A. G. CLAIRE, Asst. Mill Technologist.
D. J. CLEARY, Cadet.	Miss R. MESSER, Clerk-Typiste.

Nambour:

C. A. REHBEIN, Field Assistant.

Fifty-Fourth Annual Report of the Bureau of Sugar Experiment Stations

To the Honourable the Secretary for Agriculture and Stock

Dear Sir,

I have the honour to submit the Annual Report of the Bureau of Sugar Experiment Stations for the year ended June 30th, 1954.

Accompanying my introductory comments are the reports of Divisions dealing with Soils and Agriculture, Entomology and Pathology, Cane Breeding, and Mill Technology. The detailed operations of the four Sugar Experiment Stations are also reported upon, and the usual tabular material recording mill statistics is at the end of the report. It is hoped that the new layout presents the activities of the Bureau in more interesting and readable form.

HIGHLIGHTS OF THE 1953 SEASON

The 1953 sugar season was characterised by a number of notable achievements on both the growing and manufacturing sides. The outstanding one was, of course, the handling of 8,751,063 tons of cane and the production of ~~1,217,000~~ 1,220,383 tons of 94 n.t. sugar. These figures represent rises of 27.9 and 30.3 per cent. respectively on the previous year's performance which was, in itself, a record. It was the first operative year of the Empire Sugar Agreement and there was considerable satisfaction in the production, not only of the agreed overseas quota, but of a surplus, part of which supplied short-falls in other Empire countries. The season witnessed the lowest recorded losses from grub damage since BHC has been used commercially, the highest tonnage of both cane and sugar per acre in the industry's history, and the operation of the first dual milling train in the State.

In most districts very favourable growing conditions persisted until harvesting commenced, although in some areas the crops were retarded by a dry autumn. But little interference was experienced from wet weather in the harvesting months. At the same time soil moisture was replenished sufficiently by spaced rains in most areas to keep the young 1954 crop moving. Only in the Cairns, Proserpine and Mackay districts were very dry conditions encountered in the early summer months.

Large areas of newly assigned land produced their first crop for the 1953 season and several problems associated with the nutritional requirements of these lands were brought to light. Much of the virgin scrub and forest land was found to be deficient in one or other of the major plant foods while, in contrast, certain alluvial tracts were over-rich in nitrogen and produced rank, recumbent growth.

The harvested cane possessed a higher sugar content than was anticipated, and although the crop was some 500,000 tons below the early estimate, the amount of sugar produced was almost equal to the preliminary forecast. The tremendous task of handling two million more tons of can than was ever cut and hauled previously placed a heavy strain on transport; and to maintain the necessarily high weekly crushing rate a state of emergency, to allow Saturday morning loading, was declared in most mill areas. Shipping schedules were also made to conform as far as possible to the increased outturn of sugar, and by the end of January, 1954, the tonnage of sugar in store was only 8,700 tons higher than at the same date in 1953. By the 21st May, 1954, however, when the new season's sugar was beginning to go into store there was still 31,512 tons unshipped compared with 9,095 at the same date in 1953.

Labour difficulties caused a later start than was planned in some mills in 1953, but the general freedom from weather delays during the crushing period allowed most factories to complete operations before the end of December; only seven were compelled to continue into January.

The record crop was, in the main, the result of the harvested area rising to 332,703 acres from the previous peak figure of 275,313. In addition, and reflecting the favourable season experienced, the yield climbed to a new peak of 26.30 tons per acre, exceeding the 1951 record. Sugar per acre at 3.67 tons was also superior to any previous year.

In the last year's Annual Report it was stated that for a seven week period

from mid-September to the end of October the State's 31 factories crushed 289,000 tone of cane per week. For the same period in 1953 the figure increased to 355,877 tons, a rise of 19.4 per cent. It is notable that the highest seven-week period in 1951—only two seasons earlier—averaged only 266,000 tons, demonstrating the effect which increased crushing capacity, installed in the interim, has had on cane intake.

During the season Inkerman, with a crushing of 455,449 tons of cane, became the third mill in the State to handle a crop in excess of 400,000 tons; this record had previously been achieved by both Tully and Victoria mills. Nevertheless Inkerman's figure is a record for a single milling train in Queensland.

THE PROSPECTS FOR 1954 SEASON

The favourable climatic conditions which were so largely responsible for the 1953 crop continued to manifest themselves in the 1953-1954 summer months. In both north and south growth conditions were good, but the central areas constituted a weak spot as the result of rainfall deficiency during December and January. The wet season, although late in the last-mentioned districts, was normal in intensity and, by the time estimates were taken there was promise of a good crop.

The early crop forecast, prepared in May, 1954, indicated that 9,478,836 tons of cane would be available for harvest from 375,383 acres, and that the anticipated sugar output would be 1,308,900 tons at 94 n.t. There is, at date of writing, little reason to amend these figures appreciably. In the interim estimates have decreased somewhat in the south, but have risen in a few northern mill areas; early cut blocks have in many cases cut below estimate due to undetected damage during the February cyclone in the north, but this will be offset by a higher sugar content than usual in southern divisions.

Although the forecast predicts a gross yield of both cane and sugar which would exceed the

1953 record production, the yield per acre will not attain to that year's figures. The effects of the expansion programme are still apparent in the increased acreage for harvest—375,383 against 332,703 last year—but the growing season has not been so universally favourable. This is fortuitous in a year when the industry might well be embarrassed by a sugar output well in excess of local and overseas markets.

The growth in mill capacity is demonstrated by the high individual mill estimates. Victoria, now with a dual milling train, expects to treat 639,000 tons of cane; Inkerman anticipates 513,000 tons and twelve others are in the 350,000 to 450,000 tons bracket.

The three small New South Wales factories estimate collectively a production of 254,000 tons of cane and an output approximating 30,000 tons of 94 n.t. sugar.

For the period 1948 to 1954 only 1951 could be described as a poor year and it is unlikely that the run of good seasons will continue; the industry should take into consideration, when planning restrictive measures, the effect which a drought can have upon central and southern production; in 1953 these areas produced 47 per cent. of the total crop. A reduction of five

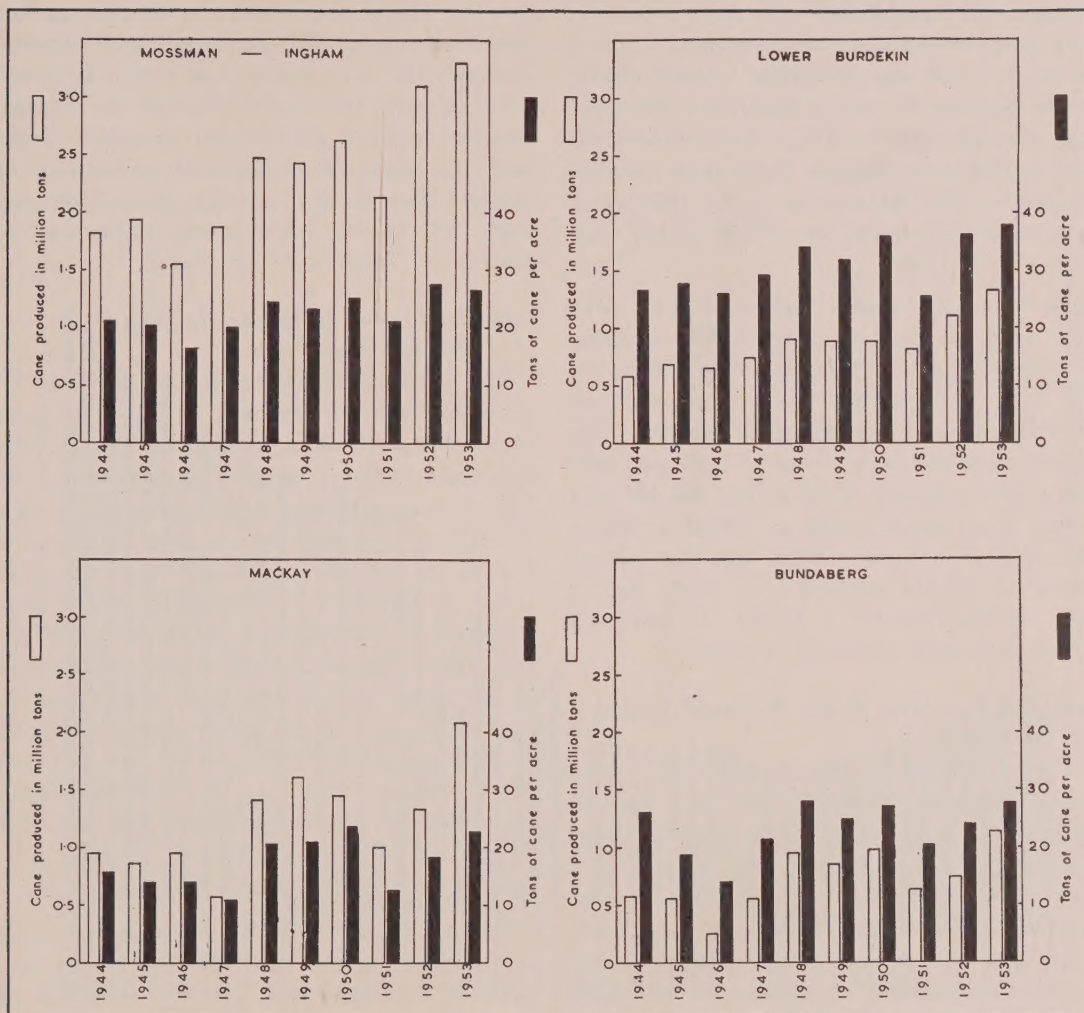


Fig. 1.

Total cane production and tons per acre in the four major districts during the past ten years.

tons per acre would, on 1953 acreages harvested from Proserpine south in that year, reduce the State's output by 115,000 tons of sugar—sufficient to convert an embarrassing surplus into an undesirable deficit.

Thought should also be given to the fact that in 1953 there was an undue proportion of plant cane in the total crop, caused by the rapid

expansion policy. Over the previous six years, 1947-52, the plant cane averaged 41.9 per cent. of the total acreage harvested. In 1953 it rose to 45.7 per cent. Assuming a normal rotation including two ratoon crops the natural inference is that in 1956 there will be an undue proportion of the State's acreage fallow, and that harvests will fall accordingly.

COMMENTS ON 1953 CROP STATISTICS

The October, 1953, crop estimate, dealing with that year's harvestable cane, predicted a crushing of 8,893,860 tons and an output of 1,234,500 tons of 94 n.t. sugar from 338,000 acres. This was proved by final figures to be

somewhat high, the actual cane crushed and sugar manufactured being 8,751,063 and 1,220,383 tons respectively; the area harvested was 332,703 acres.

New Records Established

At no previous time in Queensland's sugar history has the leap from one record output to another been of such magnitude. The 1953 crop exceeded that of 1952—itself a record—by 1,909,527 tons and the sugar made was an increase of 285,769 tons over the 1952 yield. The acreage harvested was 57,390 higher than in any earlier year.

The crushing season extended from May 27th, 1953, to January 28th, 1954, totalling 787.4 weeks for the 31 factories, an average of 25.4 weeks. Seven mills had to extend their operations beyond the end of December. The longest operating period was at Inkerman Mill where, over a season of 32 weeks, 455,449 tons of cane were handled with an output of 66,880 tons of 94 n.t. sugar. These are the highest production figures attained by a single milling train in this country. In all, 13 mills had seasons exceeding 26 weeks' duration.

Increased Crushing Rate—Reduced Length of Season

It is of interest to observe the effect of increased crushing capacity on the average crushing time. In 1952 the 31 mills averaged 23.25 weeks and, although the treated crop increased by 28 per cent. in 1953, the average crushing time was extended by only 9 per cent. If the mills had crushed at the same rate as in the previous year the average length of season in 1953 would have been 29.76 weeks.

Rise in Plant Cane Acreage

Table III illustrates in unmistakable fashion the effect of a rapid expansion policy on crop statistics. The marked rise in the proportion of plant cane is due to the large area of new land prepared and planted during 1952. In view of the fact that the largest increases in plant cane acreage occurred in the central and southern districts—which contributed 52 per cent. of the total area harvested—it must be expected that in 1956 there will be an unduly large acreage in fallow; the pendulum will have swung the other way. The ratio of plant to ratoon cane has fallen to the exceptionally low figure of 1.12; it was 1.53 in 1951. There has

been an appreciable change in the acreage of standover cane in the southern division although the area involved is still only three per cent. of the State's harvested acreage. This is expected to increase in future years both by reason of anticipated restriction of annual harvest and because P.O.J.2878 and Vesta will become more popular following the control of ratoon stunting disease.

Unit Production in Lower Burdekin Reaches New Peak

The district productivity figures in Table IV show the Lower Burdekin in an even more favourable light than previously. These four mill areas in the irrigated delta averaged 37.88 tons of cane per acre and produced 5.61 tons of sugar from each acre harvested. It is a new record for the district and, if calculated in terms of an average crop age of 16 months, indicates a production of 785 lb. of sugar per acre per month of growing season. This figure is exceeded only by the best plantations in Hawaii. The best single mill-area production was at Inkerman with 44.38 tons of cane and 6.52 tons of sugar per acre; this performance can be quoted at 913 lb. of sugar per acre per month.

District Comparisons

The figures in Table IV show that the north of Townsville section is by far the largest producer in the State and, with the exception of the Lower Burdekin, it has the highest production of sugar per acre. The Bundaberg district, however, excels it in cane production per acre—despite the very low proportion of standover cane. Both the cane and sugar production per acre are new records.

The Cane/Sugar Ratio

The peak of cane quality in Queensland was in the 1934-1944 period when it was as low as 6.73 and only once exceeded 7.00. The 1953 figure of 7.17 was better than the average of the last ten years but it is unlikely that the industry will witness a return to the time when below 7.00 was normal. The modern range of varieties is not so conducive to high quality as were the displaced noble types.

Molasses Usage

Molasses production naturally increased with the larger crop being crushed. The amount returned to the soil as fertilizer showed a healthy increase from 47,260 tons in 1952 to 75,781 tons in the year under review. The amount used represented 27.8 per cent. of total

production compared with 24.5 per cent. in the previous year. The tonnage used for stock food was practically unchanged and this appears to be the normal demand in a non-drought period. The amount run to waste is the highest since 1949 and is difficult to understand in the light of the very heavy demand for this material.

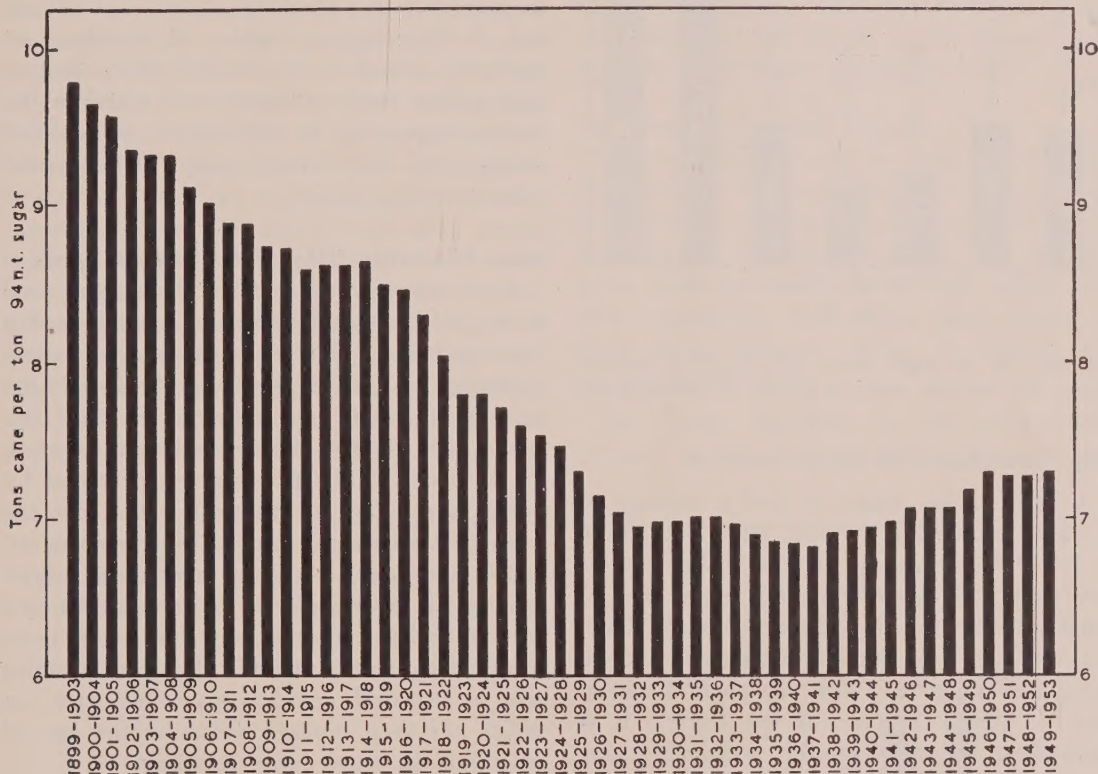


Fig. 2.
Running five-year averages of the ratio "Tons of cane per ton of 94 n.t. sugar."

BUREAU ACTIVITIES

Staff Losses and Appointments

During the year the following changes took place:—

Mr. C. B. Venton, Mill Technologist, resigned.

Mr. D. L. McBryde, Asst. Mill Technologist, died.

Mr. E. V. Humphry, Experimentalist, resigned.

Mr. J. Gatt, Field Assistant, resigned.

Mr. G. F. Phillips, Asst. to Analyst, resigned.

Mr. A. D. Beal was appointed Asst. Accountant.

Mr. J. M. Sedl was appointed Asst. to Analyst.

Mr. J. Wesdorp was appointed Asst. Agronomist.

Mr. R. B. Moller was appointed Adviser.

Mr. C. McAleese was appointed Field Assistant.

Mr. D. J. Cleary was appointed Field Cadet.

Mr. L. E. Rodman was appointed Field Cadet.

Mr. J. D. Watson was appointed Cadet Statistical Officer.

Miss P. D. Johnson was appointed Clerk-Typiste.

Several transfers were effected during the period with a view to providing better services to the industry in the various districts.

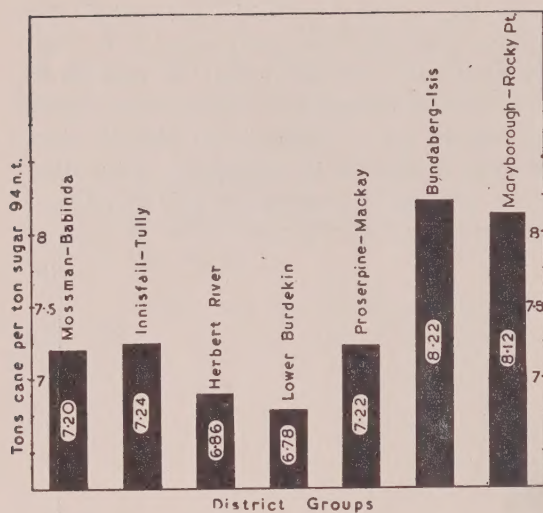


Fig. 3.

Averages for the eight years 1946 to 1953 indicate where the sweetest cane is grown in Queensland.

Mill Technologist to Study Overseas

A decision was made to send a member of the Mill Technology Division, Mr. L. R. Brain, to Natal for experience in that industry. He will work for several months under Dr. K. Douwes-Dekker at the Milling Research Institute and will gain industry experience both in Natal and Mauritius. With the planned expansion of that Division of the Bureau it is essential that some of the personnel have experience of overseas methods and practices.

Office and Laboratory Facilities

At both Meringa and Bundaberg Experiment Stations the increasing staff has created accommodation problems. The Bundaberg building was accordingly enlarged considerably to provide extra office space, and at Meringa a residence on the Station is being altered and extended to provide offices and laboratories for cane breeding and entomological personnel.

A serious space problem exists at Head Office and, since expansion is not possible, consideration is being given to the erection of a new building to accommodate the Bureau's Brisbane staff. It is hoped that the scheme will incor-

porate a building of sufficient size to include at least some of the other sugar organisations.

Temperature Control in Cane Breeding

At Meringa the seedling glasshouse has been partitioned so that one large section may be electrically heated. This alteration is designed to improve pollen development and seed setting, and to allow larger number of seedlings of desirable crosses to be obtained. Strip heaters aggregating twelve kilowatts will maintain the inside temperature at 20°F. above atmospheric during the late autumn-early winter period when arrowing occurs.

Cane Flowering Delayed by Foliage Spray

Some success was achieved during the year in the delaying of flowering by early arrowing cane varieties. The characteristic of early flowering has, in the past, made impossible the mating of certain desirable types since one would have finished before the other emerged. To some extent this problem was overcome by partial defoliation of the early canes but the method was time consuming. A new chemical, maleic hydrazide, has given very good results in delaying arrowing by up to three weeks, and certain varietal crosses, not previously practicable, have now been made. So far as is known this is the first occasion on which such an effect has been brought about by the use of chemicals in sugar cane breeding.

A Bureau-bred Variety Tops the Census List

The cane variety Q.50 which was raised from true seed in 1938 as a result of cross pollinating P.O.J.2725 with Co.290 has become the major variety in the State. In the 1953 season 2,404,698 tons of Q.50 were harvested and crushed, the variety of next importance on the list being Trojan with 1,604,092 tons. It is the first occasion in Queensland sugar history that a single variety has produced over two million tons of cane. Q.50 is now grown extensively in the far north and in the south, as well as in the Mackay district where it was originally selected and propagated. Its suitability to a wide range of latitudes is exceptional.

Ratoon Stunting Disease

The control of this disease, and its implications in relation to varietal decline, have been one of the major projects of Bureau staff during the year. The first series of field trials comparing the yielding capacity of healthy and diseased material has not yet been harvested but, in the current year, a further — and more extensive series — has been planted. It has been somewhat disquieting to find that the hot water curative treatment is very critical, and that complete eradication of the disease has not been effected where circulation of water in treatment tanks has been impeded. Precise experimentation has shown that cane plants enclosed in jute sacks do not receive the correct time-temperature treatment, but that where wire-enclosed containers are used the control is effective. The explanation lies in the rapid circulation of water at the correct temperature, and in the maintenance of that temperature during the period when the cane plants are

absorbing heat from the water. Recent progress in the understanding and control of this disease are the subject of a Technical Communication now in preparation. This disease, which is now known to be world-wide in distribution, was discovered by the pathology division of this Bureau, and in consequence the Australian sugar industry has advanced further in the understanding and control of the disease than has any other sugar producing country.

The General Varietal Picture

In North Queensland the field is still predominated by Trojan, Badila, and Pindar. Q.50 is building up in drier soil areas and constituted 14 to 16 per cent. of the crop in two mill districts. With the exception of Q.57, which may attain popularity, there is no other variety in sight at the moment likely to replace the existing major canes.

The Lower Burdekin is well served with Trojan, Badila, S.J.16, and Pindar. In the

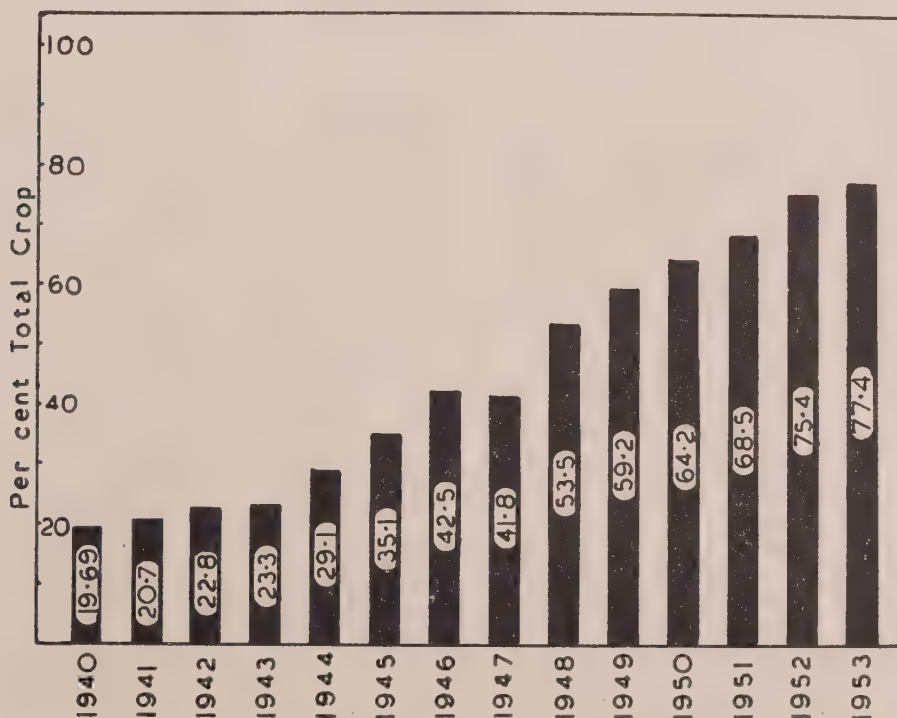


Fig. 4.

Between 1940 and 1953 the percentage of Queensland-bred varieties in the total crop has increased from less than 20 to over 77 per cent.

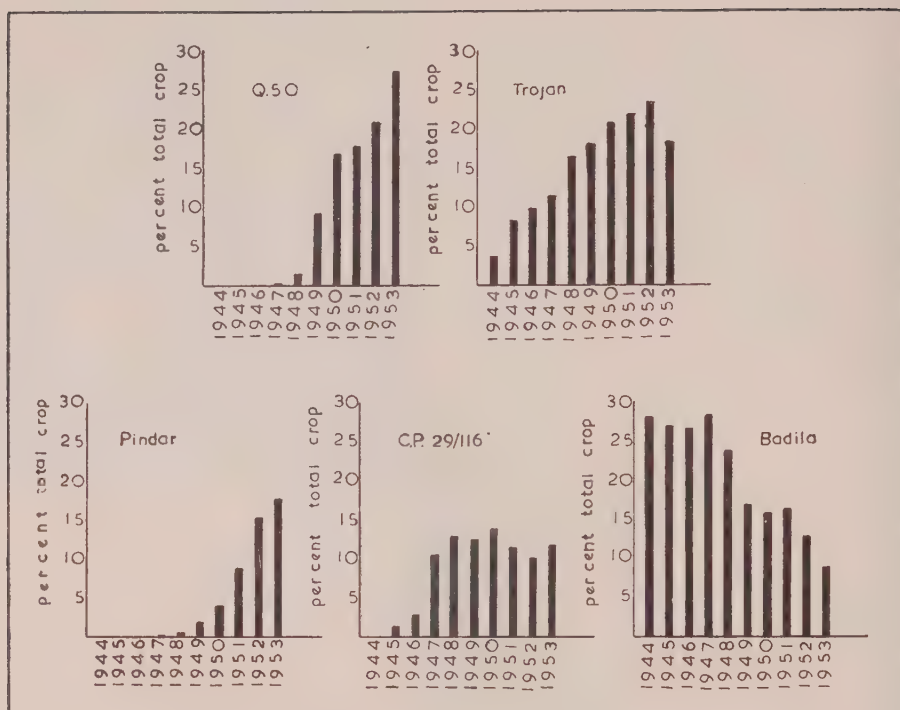


Fig. 5.

The five major varieties in recent years—illustrating varietal trends.

central districts there is reason for some concern that one variety, Q.50, dominates the varietal picture so completely. There is justification for increasing plantings of other varieties suited for both early and late harvesting.

In the south C.P.29/116, which has provided such a large proportion of the crop for some years, is losing ground to Q.50 and Q.47. This is a healthy move since C.P.29/116 was unsuited for early cutting. The release of N.Co.310 this year will provide an early maturing variety and this, together with those mentioned above, will give a nicely graded range of early, mid-season, and late types.

1954—The End of Fiji Disease ?

The Fiji Disease diagram reproduced in this report illustrates the positive manner in which the incidence of this once major disease has been reduced. The complete freedom of the Bundaberg, Isis, and Maryborough districts during recent years is proof of the effectiveness of the eradication measures carried out. In

the current year a mere 14 stools infected with this disease were located and dug out in the Moreton area, and both of the diseased fields will be ploughed out in 1954. Judging by past experience there is room for belief that the control is complete in that district.

Bagasse Experiments

Queensland is one of several sugar countries interesting itself in the use of surplus bagasse as a soil amendment. The material is low in plant food content but its use is directed at improving physical condition and drainage. In the trial on Mackay Experiment Station an attempt has been made, by using deep rippers, to incorporate some of the bagasse with the heavy clay subsoil. The aim is to establish channels for moisture storage and root penetration and generally to extend the root zone of the crop. Transport of such low volume weight material is a factor, but should trials show some benefits, baling of the bagasse could be considered.

Work is also proceeding with bagasse-molasses formulations designed to produce suitable stock food concentrates in an easily handled form. It is hoped to arrange stock feeding trials in conjunction with the Department of Agriculture and Stock.

Post Graduate Course in Sugar Technology

This course, which was initiated by the Bureau, and the maintenance costs of which are paid from Bureau funds, attracted nine students during 1952 and 1953. Five of these are now employed in research capacities in the Queensland industry, and the other four returned to the sugar industries in their respective countries. The course is designed to give a year's training in sugar technology to students who have previously graduated in Applied Science or Chemical Engineering.

Soil Analysis

The increased number of soil samples received for analysis at Bureau laboratories made necessary the strengthening of analytical staff. At the same time speedier methods of analysis were made possible by the addition of a flame photometer to laboratory equipment. It is planned to improve the soil analysis-fertilizer recommendation service still further by decentralising the soil analysis section, and locating analysts at some of the experiment stations. This procedure will have the additional advantage of making possible on-the-spot investigations of soil conditions in such cases where analysis does not provide the answer to a cane grower's problem.

New Experiment Station Officially Opened

In June, 1954, the Bureau's fourth full scale Experiment Station was opened by the Honourable the Minister for Agriculture and Stock, Chairman of the Sugar Experiment Stations Board. This unit in the chain, located near Ayr in the rich Lower Burdekin delta, is 90 acres in area and is equipped with a 6-7 in. centrifugal pump delivering 70,000 galls. of water per hour. The water is reticulated throughout the farmed area by means of 12-inch underground con-

crete piping. The Station now possesses its own office-laboratory building and a modern glass-house for seedling raising. A resident assistant agronomist is beginning investigations aimed at a better understanding of soil moisture relationships and water requirements in this intensively irrigated district.

Variety Garden

A small isolated area of land in the Bundaberg district, previously used by the Bureau for downy mildew disease resistance trials is to be reserved for a varietal collection. It is not proposed to maintain a very extensive range of material, but to utilise the available space for (a) varieties previously grown commercially in Queensland, (b) present day commercial types, (c) a selection of breeding canes, and (d) recent introductions from other countries. The prime use of the collection will be to provide a source of disease free material for various local districts, and to fill overseas requests. The location is convenient, an irrigation plant is installed, and the planting is well protected against marauding animals.

Herbert River Activities

The Bureau's new centre in the Ingham area was established during the year and a good start made with field experimental work. There has been a considerable demand for soil analysis and fertilizer advice. Many of the soils analysed have been highly acid and it is anticipated that beneficial effects would be obtained from lime applications. Clean Q.57 stocks were introduced from the Lower Burdekin and this variety is expected to perform well on certain soil types. Q.50 plantings are being extended, after hot water treatment, on to the poorer and drier areas.

Ratoon stunting disease investigations have been limited to the planting of demonstration strips of diseased and healthy material. As soon as the supply of clean plants is adequate replicated trials with clean and diseased stocks of all commercial varieties will be inaugurated.

The excessive richness of the newly cultivated alluvial flats at Abergowrie have created a varietal problem. There the fertility is not likely to decrease greatly after a few years of cane growth and specialised varieties will be needed which will remain erect and develop good sugar content. A series of newly introduced canes, selected specifically for such conditions, will be planted on these soils.

The Mechanism of Ratooning

Studies were initiated during the year to discover the reasons for reduced yield potential of ratoon stubble in comparison with plant cane. The first stage in the investigation has been the dissection of ratoon stools and the recording of the condition and behaviour of every underground bud. This has been performed on stubble giving rise to first, second, and third ratoon stools. Initially the following observations have been made, although these may be amended as the study proceeds.

- (a) A proportion of the below-ground buds on each stalk had begun to grow at some

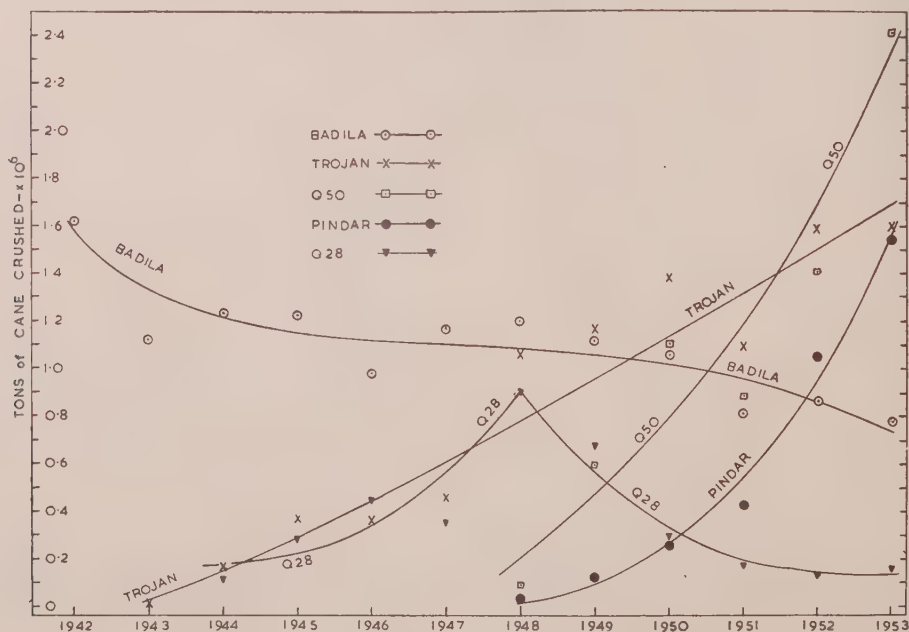
stage before the stool was harvested, and had subsequently died.

- (b) The buds which had died were invariably confined to the lowest portion of each stalk.

- (c) At, or about, the time the stool is harvested almost all of the living underground buds on each stalk begin active growth.

Effect of 2,4D on Sugar Content of Cane

Initial experiments have failed to show any significant differences in sugar content between sprayed and unsprayed stools. Some overseas investigators claimed a rise of one to two per cent. in sugar content some three weeks after spraying the dilute 2,4-D solution on to the leaves. In Queensland a randomised block experiment showed no differences during the three-week period, nor in two samplings carried out at monthly intervals after the three weeks. The work is being repeated because of the potential value of such a rise in sugar content if attainable early in the season.



The decline of Badila and Q.28, and the rise of Q.50, Trojan and Pindar, during the past ten years.

Extensive Area of Experiments

A summation of Experiment Station operations during the year shows that 103.4 acres of experiments were harvested. This, however, is not a measure of the extent of field investigations conducted. A large number of farming properties were co-operatively utilised for Bureau investigations in the fields of varieties, fertilizer, lime, insecticides, fungicides, etc. The extension work in these projects is designed to demonstrate by farm trial hand in hand with personal discussion. The Bureau appreciates the large measure of assistance given by growers in having such trials on their properties; these co-operators are playing an important part in our research and extension activities.

Sugar Cane Wax

Unexpected difficulties, associated with the scaling down of plant size, have resulted in plans being made to convert the continuous type pilot plant to a batch process. This work is being pushed ahead mainly because of the interest being shown by a Queensland mill in erecting a wax extraction plant. On the figures available the mud from this factory contains a higher than normal percentage of this material. The Australian market, at the present time, is not particularly interested in a crude produce but the prospects appear good for refined and bleached waxes.

PUBLICATIONS BY BUREAU STAFF

In the Proceedings of the Queensland Society of Sugar Cane Technologists

- Buzacott, J. H.: Rich Land and Low Sugar.
Hughes, C. G.: The Year 1953 in Queensland Sugar Cane Pathology.
King, N. J.: An Analysis of Trash Conservation.
Nicklin, J. H.: Power Costs for Irrigation.
Story, C. G.: Standover Cane in the Central District, 1951.
Toohey, C. L., & Matthews, A. A.: Chemical Weedicides—Mackay District.
Venton, C. B.: Some Thoughts on Overseas Milling Practices.

In the Proceedings of the Eighth Pacific Science Congress

- King, N. J.: Ratoon Stunting Disease—A New Disease in the Sugar Cane World.

In the International Sugar Journal

- King, N. J.: The Implications of Ratoon Stunting Disease.

In the Louisiana Sugar Journal

- King, N. J.: The Mechanisation of Cane Planting.

In The New Phytologist

- Skinner, J. C.: Studies on the Growth of Excised Roots. II Observations on the Growth of Excised Groundsel Roots.

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- Hughes, C. G.: The Control of Sugar Cane Diseases in Queensland.
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Overseas Report

- Venton, C. B.: A Report on Sugar Manufacture in the Caribbean Area and U.S.A.

Operations Reports

- 54/1. Experiments with Active Magnesium Oxide in the Filtration of Muds.
54/2. Report on the Milling and Press Tests, 1953 Season.

Pamphlet

- The Australian Sugar Industry — Some Facts and Figures.

Periodic Publications

- Four issues of the Cane Growers' Quarterly Bulletin and two News Letters were issued.

THE SUGAR EXPERIMENT STATIONS BOARD

The Board met on four occasions during the year. The three-year term of the two industry members terminated on June 30th, 1954, but both were renominated by the Queensland Cane Growers' Council and the Australian Sugar Producers' Association to serve for the next three years.

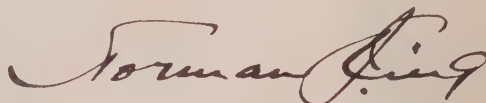
The Deputy Chairman and the two industry members inspected all four Sugar Experiment Stations during the period, and familiarised themselves with local operations at each centre; this procedure was the result of a Board decision to make annual visits to each of the Bureau's country establishments. In addition a Board member attended the Conference of the Queensland Society of Sugar Cane Technologists and the Conference of Cane Pest and Disease Control Boards.

One of the Board's quarterly meetings was held at Ayr on the occasion of the official opening of the new Sugar Experiment Station in that district; the opening was arranged to coincide with a field day on the Station.

The growth of the industry and the increasing demand for research services resulted in the Board making many decisions on policy during the year. Its appreciation of the value of overseas experience was demonstrated by a decision

to send one man away each year to gain further knowledge in his particular field. The enlargement of staffs on Experiment Stations, and the resultant difficulties in accommodation, made necessary the planning of a building programme; this included extensions and alterations at Bundaberg, remodelling and occupation of a further building at Meringa, and the construction of a new office-laboratory at Mackay. Consideration was also given to a new headquarters in Brisbane where the staff has outgrown the existing floor space. A building reserve fund was established for this purpose. The Board also decided to strengthen, by recruitment, certain of the Bureau divisions where it was considered that increased investigations were necessary; these included mill technology, agronomy, cane breeding, and pathology. Particular attention was given to the Post Graduate Course in Sugar Technology since insufficient students were passing through the course to fill the demands of the industry.

Yours faithfully,



Director.

Sept. 15th, 1954.

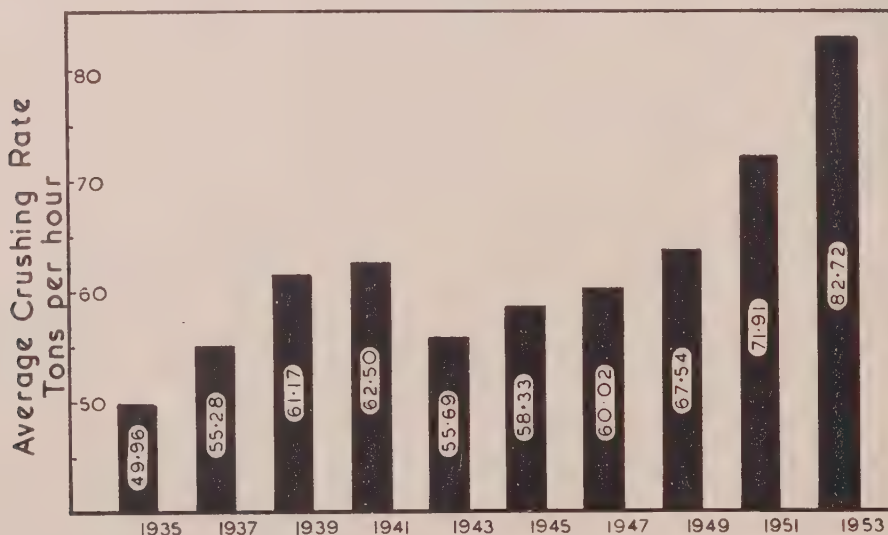


Fig. 7.

Average crushing rate—Queensland mills in two-year periods (excluding C.S.R. mills, Rocky Point and Eagleby). Pioneer and Inkerman excluded 1934 to 1944. Mt. Bauple ceased operations after 1950.

APPENDIX I

"The Sugar Experiment Stations Acts, 1900 to 1954"

Statement of Receipts and Disbursements of Funds of the Sugar Experiment Stations Board
for Period 1st July, 1953, to 30th June, 1954.

Receipts				Disbursements			
		£	s. d.			£	s. d.
Balance, 1/7/53	.. .. .	33,338	15 7	Salaries	.. .. .	54,543	17 1
Assessment	.. .. .	146,212	3 0	General	.. .. .	43,782	1 6
Government Subsidy	.. .. .	7,000	0 0	Ayr	.. .. .	5,113	17 1
Ayr	.. .. .	5,514	16 7	Bundaberg	.. .. .	4,563	14 2
Bundaberg	.. .. .	3,228	16 3	Mackay	.. .. .	5,372	10 3
Mackay	.. .. .	3,451	0 8	Meringa	.. .. .	6,786	13 10
Meringa	.. .. .	2,329	14 7	Investment (Building Fund Reserve)	.. .. .	70,000	0 0
Sundries	.. .. .	4,519	14 3				
						£190,162	13 11
				Balance, 30/6/54	.. .. .	15,432	7 0
		£205,595	0 11			£205,595	0 11

Appendix II

C.C.S. Formula

C.C.S. in cane = $\frac{\text{Pol in cane} - \text{Soluble impurities in cane}}{2}$

In practice, per cent. C.C.S. is calculated by the empirical formula—

$$\text{C.C.S.} = \frac{3P}{2} \left(\frac{1 - 5 + F}{100} \right) - \frac{B}{2} \left(-1 - \frac{3 + F}{100} \right)$$

where—

- P = pol in first expressed juice.
- B = brix in first expressed juice.
- F = fibre in cane.

SUGAR VALUES, 1953² SEASON

The Sugar Board has declared the final prices for the 1953² season's sugar as follows:—

	No. 1 Pool			No. 2 Pool	Total
	Home Consumption	Surplus	Total	Excess	
Tons	463,218	415,386	878,604	55,622	934,226
Per cent.	52.7221	47.2779	100	—	—
Price	£44 3 0	£41 2 0	£42 14 2	£41 2 0	£42 12 3

In addition the values for New South Wales production were:—

	Home Consumption	Surplus	Total
Tons	14,263		14,263
Per cent.	100		100
Price	£44 3 0		£44 3 0

Table I.
Sugar Cane Harvested, 1953—Estimated, 1954.

Domestic Tonnages	Actual Tonnages		Mills	Estimated, 1954 (May estimate)
	Accepted	Condemned		
200,835	200,835	—	Mossman	230,000
321,452	321,452	—	Hambledon	361,000
323,768	323,768	68	Mulgrave	370,000
311,231	311,231	—	Babinda	364,000
270,082	270,082	132	Goondi	327,000
379,065	379,065	—	South Johnstone	385,000
239,376	239,376	—	Mourilyan	254,261
399,182	399,182	25	Tully	435,000
493,057	513,015	—	Victoria	610,000
358,717	357,710	—	Macknade	399,600
3,296,765	3,315,716	225	..	3,735,861
171,813	152,862	20	Invicta	207,000
337,835	337,835	—	Pioneer	380,000
360,441	360,441	42	Kalamia	370,000
455,449	455,449	50	Inkerman	507,000
1,325,538	1,306,587	112	..	1,464,000
383,555	383,555	7	Proserpine	366,000
150,296	150,274	—	Cattle Creek	160,000
346,232	346,241	30	Farleigh	360,000
348,421	348,453	95	Racecourse	350,000
180,226	180,187	—	North Eton	240,000
323,457	323,426	4	Marian	332,520
361,851	361,931	16	Pleystowe	381,923
373,205	373,176	83	Plane Creek	350,000
2,467,243	2,467,243	235	..	2,540,443
126,623	137,535	—	Qunaba	134,100
313,334	300,975	36	Millaquin	297,000
307,932	308,622	133	Bingera	297,000
288,658	285,950	—	Fairymead	297,000
91,236	91,236	374	Gin Gin	108,000
289,371	292,836	4	Isis	274,608
94,682	94,682	127	Maryborough	136,824
132,361	132,361	31	Moreton	162,500
17,320	17,320	7	Rocky Point	31,500
1,661,517	1,661,517	712	..	1,738,532
8,751,063	8,751,063	1,284	..	9,478,836

Table II.
Sugar Production (94 Net Titre), 1948-1953.

Districts	1948	1949	1950	1951	1952	1953
North of Townsville	356,969	345,684	344,944	304,786	421,921	467,716
South of Townsville	553,080	551,583	534,900	399,556	512,693	752,667
Totals*	910,049	897,267	879,844	704,342	934,614	1,220,383

* Local Sales included.

Table III.
Classes of Cane Harvested, 1953.

Districts	Plant Cane		Ratoons		Standover		Total Acres
	Acres	%	Acres	%	Acres	%	
Northern	46,273	37.0	78,662	62.9	133	0.1	125,068
Burdekin	21,637	61.8	13,352	38.2	5	—	34,994
Mackay	59,800	55.0	48,781	44.8	218	0.2	108,799
Southern	24,346	38.1	28,870	45.2	10,626	16.7	63,842
Whole State	152,056	45.7	169,665	51.0	10,982	3.3	332,703

Table IV.
Total and Average Yields by Districts, 1953.

Districts	Tons of Cane	Tons Cane per Acre	Tons 94 N.T. Sugar per Acre
Mossman-Ingham	3,296,765	26.36	3.72
Lower Burdekin	1,325,538	37.88	5.61
Proserpine	383,555	22.67	3.15
Mackay	2,083,688	22.68	3.27
Bundaberg-Gin Gin	1,127,783	27.70	3.38
Childers-Maryborough	384,053	23.33	2.94
Nambour-Beenleigh	149,681	22.43	2.87
Whole State	8,751,063	26.30	3.67

Table V.
Acres Cultivated and Harvested, Yields of Cane and Sugar, Acre Yields and Quality of Cane, 1944-1953.

Year	Acres* Cultivated	Acres Harvested for Milling	Total Yields		Yields per Acre		Tons Cane per ton Sugar
			Cane	Sugar	Cane	Sugar	
1944	317,386	222,215	4,398,190	643,540	19.79	2.90	6.83
1945	326,247	239,826	4,551,982	644,661	18.98	2.69	7.06
1946	317,766	228,395	3,714,475	512,086	16.26	2.24	7.25
1947	332,516	220,649	4,150,987	†571,658	18.81 **	2.59 **	7.26
1948	384,213	258,585	6,433,556	†910,049	24.88	3.52	7.07
1949	395,660	275,313	6,518,021	†897,267	23.67	3.26	7.26
1950	381,545	257,562	6,691,706	†879,844	25.98	3.42	7.61
1951	388,348	273,371	5,005,172	†704,342	18.31	2.58	7.11
1952	419,834	274,757	6,841,536	†934,614	24.90	3.40	7.32
1953	466,484	332,703	8,751,063	†1,220,383	26.30	3.67	7.17
Averages	—	258,338	5,705,669	791,845	21.79	3.06	7.22

* Supplied by Government Statistician. † Includes Local Sales.

Table VI.
Details of Molasses Disposals for Periods 1944-1953.

Usage	Tons of Molasses									
	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953
Distilleries	59,516	61,307	69,842	54,014	119,615	115,376	99,940	79,063	99,410	154,152
Fertilizer	17,885	20,095	18,938	23,276	34,655	49,293	36,446	34,529	47,260	75,781
Stock Feed	30,742	30,559	45,288	34,808	38,349	36,479	36,621	37,151	37,099	36,263
Mill Fuel	14,668	11,426	6,238	9,340	11,003	9,771	15,556	6,327	5,882	1,211
*Ferment	—	—	—	—	2,479	3,561	3,582	2,033	2,532	3,196
Other Purposes ..	1,657	2,765	1,575	2,047	161	1,204	231	9	151	217
Wasted	109	333	415	99	1,099	1,858	325	235	482	1,111
Totals	124,577	126,485	142,296	123,584	207,361	217,542	192,701	159,347	192,816	271,931

* Prior to 1948, Molasses used for cleaning Ferment was included with that shown under heading "Other Purposes".

Table A.
Summary of production and consumption figures and sugar values for ten years.

Year	Total Sugar Production at 94 n.t.*	Total Sugar Exported at 94 n.t.	Average Australian Price	Average Export Price	Average Price No. 1 Pool Sugar	Average Price all Sugar	Total Value
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£
1944	643,475	208,679	22 2 0	15 0 6	19 18 1	19 16 1	12,744,000
1945	644,624	205,453	21 18 0	16 17 9	20 8 2	20 6 1	13,087,000
1946	512,035	72,578	21 18 0	21 10 0	21 16 11	21 16 10	11,184,000
1947	571,503	95,246	24 0 0	29 12 6	24 16 0	24 18 9	14,251,000
1948	909,896	440,814	23 1 0	28 2 0	24 17 0	25 9 11	23,198,000
1949	896,236	431,254	24 6 0	29 7 6	26 9 3	26 14 10	23,967,000
1950	879,689	395,151	24 11 0	32 16 6	28 4 1	28 5 4	24,866,000
1951	704,043	154,486	33 14 0	36 15 6	34 7 4	34 7 6	24,201,478
1952	934,226	471,008	44 3 0	41 2 0	42 14 2	42 12 3	39,809,705
1953	1,220,025	730,566	47 18 6	39 18 0	43 8 3	42 7 11	51,723,936

* Not including Local Sales.

Table B.
Table of Mill Peaks (Tons of 94 n.t. Sugar).

Mill	1929	1939	1949†	1950†	1952	1953	1954	Best Year's Output
Mossman	14,972	20,000	22,000	22,000	24,000	31,000	31,000	28,104
Hambledon	31,836	36,000	39,600	39,600	41,000	44,000	44,000	46,544
Mulgrave	31,643	36,000	40,100	40,100	40,500	47,500	47,500	46,835
Babinda	31,901	36,000	39,600	39,600	42,500	46,000	46,400	41,932
Goondi	27,034	29,500	32,400	32,400	34,500	38,000	38,000	36,786
South Johnstone	30,979	36,000	39,600	39,600	42,500	47,000	47,000	53,550
Mourilyan	23,630	27,000	29,700	29,700	31,000	34,000	34,000	33,335
Tully	30,930	38,000	42,100	42,100	45,000	47,000	47,000	55,140
Macknade	30,952	34,000	39,900	46,500	48,500	52,000	52,000	51,320
Victoria	32,221	37,500	43,600	49,100	52,000	78,000	82,000	75,294
Invicta	11,736	16,000	18,300	19,100	20,500	30,000	30,000	22,291
Kalamia	26,053	31,000	35,400	35,600	38,000	48,000	48,000	54,307
Pioneer	21,391	26,000	30,100	34,000	35,500	45,000	45,000	50,297
Inkerman	*24,207	31,000	36,800	42,000	45,000	55,000	55,000	66,880
Proserpine	16,650	23,000	26,300	33,000	35,000	43,000	43,000	53,342
Farleigh	16,993	23,000	27,600	32,400	33,500	42,000	42,000	48,878
Racecourse	18,066	24,000	29,000	35,200	36,500	42,000	42,000	49,776
Pleystowe	19,781	24,000	29,200	35,900	37,000	45,000	45,000	52,961
Marian	18,997	24,000	28,600	32,300	33,500	42,000	42,000	48,021
North Eton	9,319	12,000	14,500	15,900	17,500	26,000	26,000	25,867
Cattle Creek	8,791	12,000	13,400	14,100	14,500	20,000	20,000	21,766
Plane Creek	18,233	24,000	28,600	30,800	32,500	42,000	42,000	53,554
Fairymead	15,882	21,000	25,700	28,600	29,500	37,000	37,500	34,115
Qunaba	8,940	10,000	11,200	12,700	13,500	15,500	16,500	16,124
Millaquin	14,443	19,000	24,100	29,600	31,000	35,000	39,000	38,343
Bingera	17,864	23,000	27,800	31,000	31,500	37,000	37,000	37,977
Gin Gin	6,000	6,500	8,000	8,400	9,000	12,500	13,000	10,513
Isis	28,011	27,000	30,000	30,200	31,500	33,000	35,000	36,920
Maryborough	3,862	7,500	9,500	9,500	17,300†	14,500	20,000	11,895
Mount Bauple	6,231	6,500	7,200	7,200	—	—	—	—
Moreton	11,586	14,000	16,000	16,000	16,500	20,000	20,000	19,013
Eagleby	280	300	—	—	—	—	—	—
Rocky Point	2,014	2,200	2,700	2,700	2,780	3,500	4,000	2,396
	611,428	737,000	848,600	916,900	963,080	1,152,500	1,170,900	

* Increased by 2,500 tons in 1938.

† Does not include 3 per cent. for Soldiers' Settlement.

‡ Includes 4,800 tons for Mt. Bauple.

Division of Soils and Agriculture

Soil Technology

(L. G. Vallance, Assistant Director)

ANALYTICAL WORK

The number of samples of various kinds handled by the Brisbane Laboratory was the highest yet recorded; 1,473 soil samples were analysed, of which 1,298 were taken from farm properties for the purpose of making fertilizer recommendations, while the remainder were from experimental plots. During an investigation of variable c.c.s. contents of cane in the Babinda district 234 samples of cane leaves were analysed for nitrogen, phosphoric acid and potash. Forty-three miscellaneous samples consisting of mill by-products, irrigation waters, etc., were also analysed, making a total of 1,750 samples dealt with during the year.

Soil Fertility

The analytical figures of the soil samples

showed no radical changes in fertility levels from those of previous years. It is interesting, however, that the proportion of samples which were deficient in phosphate was rather greater than usual. This is due to the larger number taken from the newly assigned lands which are being brought under cane for the first time. With a few exceptions virgin soils in most sugar areas are deficient in available phosphoric acid and the large number of analyses carried out on these new lands has been instrumental in enabling a satisfactory fertilizer programme to be used. The following table indicates the percentage of samples at the various fertility levels insofar as available phosphate and potash are concerned.

District	Phosphate			Potash			No. of Samples
	Low	Fair	Good	Low	Fair	Good	
Mossman-Babinda.. .. .	% 28	% 7	% 65	% 42	% 31	% 27	241
Innisfail	39	13	48	37	27	36	180
Ingham	51	20	29	28	31	41	148
Ayr	6	0	94	6	3	91	31
Mackay	65	14	21	69	15	16	343
Bundaberg	58	9	33	54	14	32	322
Southern	43	18	39	39	18	43	33
Totals	49	12	39	49	21	30	1298

FERTILIZER TRIALS

Several fertilizer trials of the usual type involving three levels of nitrogen, phosphoric acid and phosphate were harvested. The results indicate that the major responses were given

by sulphate of ammonia and muriate of potash. This again emphasises the build up of available phosphate in many sugar cane soils due to past fertilizing practice.

Accumulation of Plant Foods

In some soils, however, a large reserve of both phosphate and potash has been accumulated as a result of heavy fertilizer applications over the years, and in such instances no response to further fertilizer dressing is obtained. This was clearly shown by the results of a trial in progress at South Johnstone, the plant and first ratoon crops of which have now been completed. Before the trial was laid down the soil was analysed and the figures obtained indicated that a plentiful supply of phosphate and potash was present. A good green manure crop had also been ploughed in prior to planting and it therefore appeared unlikely that any response would be obtained to sulphate of ammonia in the plant cane or to superphosphate and muriate of potash in either plant or first ratoon crops. The yield figures in tons of sugar per acre revealed that such was the case and the results of the trial emphasised the value of a soil analysis in planning an efficient fertilizer programme. It is not suggested that this accumulation of plant foods occurs universally throughout the sugar lands, but it undoubtedly

occurs quite frequently and the growers concerned might well exploit its possibilities as a means of decreasing their costs of production.

Top Dressing with Sulphate of Ammonia

Further trials were harvested in the Innisfail area to investigate the advisability of applying sulphate of ammonia to ratoon cane at the time the ratooning operations are carried out, i.e., in early October rather than at the end of the year. The observed results showed that this earlier application produced the same yields of sugar per acre as that which was applied at the usual time. Its advantage lies in that fact that by combining the application of the sulphate of ammonia with that of the ratooning mixture (which must be applied early) at least one farm operation is saved.

Sulphate of Ammonia versus Nitro-Chalk

Nitro-chalk is a fertilizer that is widely used in other parts of the world for supplying nitrogen to crops. Some time ago the fertilizer control authorities indicated the desirability of the sugar industry using nitro-chalk in order to relieve the demand for sulphate of ammonia.



Fig. 8.



Fig. 9.

Underground portions of ratoon stools illustrating the gradual rising of the stool towards the soil surface. Studies suggest that all deeply placed buds develop in the plant or first ratoon crop.

Unfortunately this material absorbs moisture readily in humid climates and is therefore not a satisfactory substitute for sulphate of ammonia insofar as the sugar areas are concerned. This was shown by the marked deterioration which occurred in test bag samples stored at the several sugar experiment stations. In addition

a trial on ratoon cane was set out at Mackay Experiment Station in which nitro-chalk was compared with sulphate of ammonia at two different levels. The results showed that nitro-chalk was not superior to sulphate of ammonia for supplying nitrogen to sugar cane although it may be regarded as being of about equal efficiency in this respect.

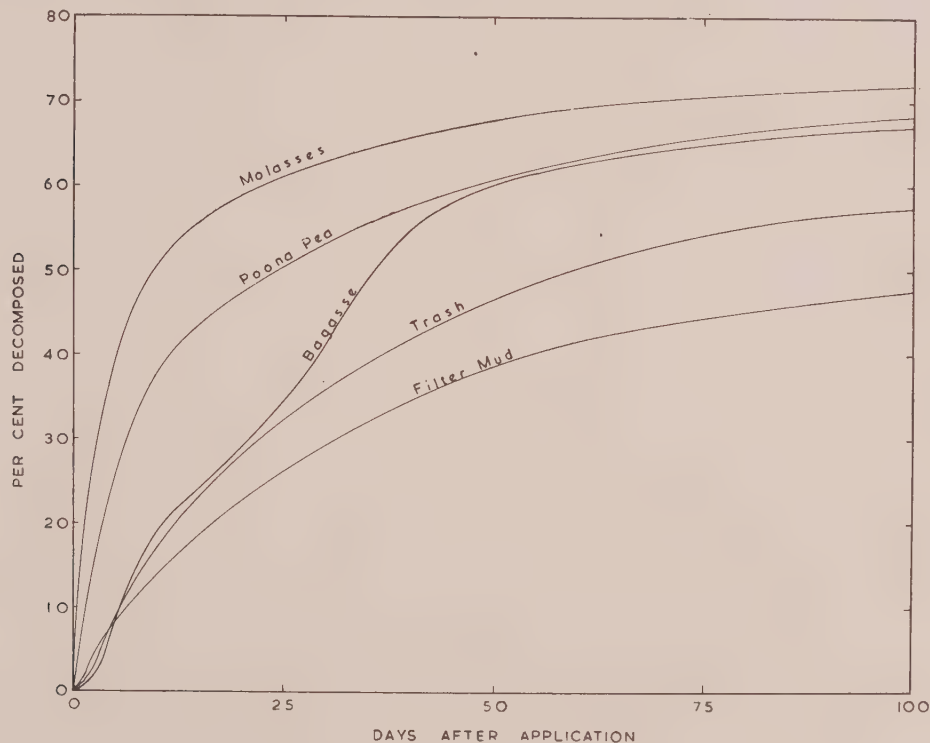


Fig. 10.

RATE OF DECOMPOSITION OF ORGANIC MATERIAL

Organic materials such as molasses, green manure crops, filter muds, etc., are widely used throughout the industry for application to sugar cane soils. Their beneficial effect is two-fold and both the physical condition and plant nutrient content of the soil are affected to varying degrees. Studies of their behaviour on several soil types were reported last year and further investigations were made during the past twelve months. The following graph shows clearly the rate at which the various materials (Poona pea, molasses, cane trash, bagasse and

filter mud) decomposed under laboratory conditions when applied to a red schist soil from Freshwater. It is evident that molasses was the most rapidly decomposed material in the initial stages, but after 100 days there was little to choose between it and either Poona pea residues or bagasse. At this stage approximately 70 per cent. of each material had been completely decomposed. Cane trash and filter mud were much more resistant to decomposition throughout the course of the experiment.

Depression of Ammoniacal and Nitrate Nitrogen

Since nitrogen as ammonia or nitrate comprises the greater proportion of the nitrogen available to the cane plant the accumulation or depression of these two forms were measured under laboratory conditions during the decomposition of the materials reported above. The soils to which the various organic materials were applied were: Bundaberg red volcanic, Burnett alluvial, Bartle Frere buff alluvial and a Cairns red-brown schist. The results may be briefly summarised by stating that the application of molasses, bagasse, cane trash and filter mud in each instance brought about a depression of available nitrogen of varying intensity throughout the course of the experiment. Poona pea was the only material which maintained the treated soil at a higher avail-

able nitrogen content than the check samples. The nitrogen content of the Poona pea was higher than that of the other materials used and in addition its carbon-nitrogen ratio was lower. It was evident throughout the experiment that these two factors exerted a most important control on the degree of depression which occurred. In the case of bagasse the nitrogen fixation was very marked for a period of thirty weeks. It must be pointed out that these experiments were carried out under laboratory conditions and the results obtained may not necessarily apply to the same extent in the field. They must, however, cast some doubt on the advisability of relying solely on a molasses or filter mud application to supply the nitrogen needs of a crop without some supplementing by the use of a nitrogenous fertilizer.

LEAF ANALYSES AND C.C.S. VALUES AT BABINDA

In order to ascertain whether the low and variable c.c.s. values frequently encountered at Babinda were related to nutritional deficiencies a number of fields were selected and representative samples of the leaves of the cane were taken for analysis at regular intervals. The sampling was commenced in October, 1952, when the cane was about 6 months old, and continued to the following April, just before harvest. The fields were selected on their past history and after harvest were divided into two categories according to whether the cane was above or below mill average c.c.s. It is a well known characteristic of many mill areas that some fields will consistently produce cane below average c.c.s. whilst others are just as consistently above average. In many cases there are no very obvious reasons for this behaviour.

Although no significant differences were found between the nitrogen, phosphoric acid and potash contents of the leaves from the high and low c.c.s. fields, there is a suggestion that low c.c.s. is accompanied by slightly higher leaf contents of nitrogen and potash. This is readily seen in the accompanying graph which also indicates that such a trend did not apply to phosphate.

A marked feature of these curves is the pronounced decrease in leaf nitrogen percentage during the wet season (January to April). With regard to potash the wettest month which was January, coincided with the lowest leaf content, but otherwise the relationship was not particularly consistent. The behaviour of phosphate is noteworthy in that it remained constant throughout the period and was unaffected by variations in rainfall.

CLAY MINERAL STUDIES

Further work was done in the investigation of the clay mineral constituents of the soils of the sugar belt of coastal Queensland. With the co-operation of the Masonry Investigations

Section, Building Materials Research, C.S. I.R.O., x-ray diffraction methods were used to supplement the information previously obtained from differential thermal and chemical analyses.

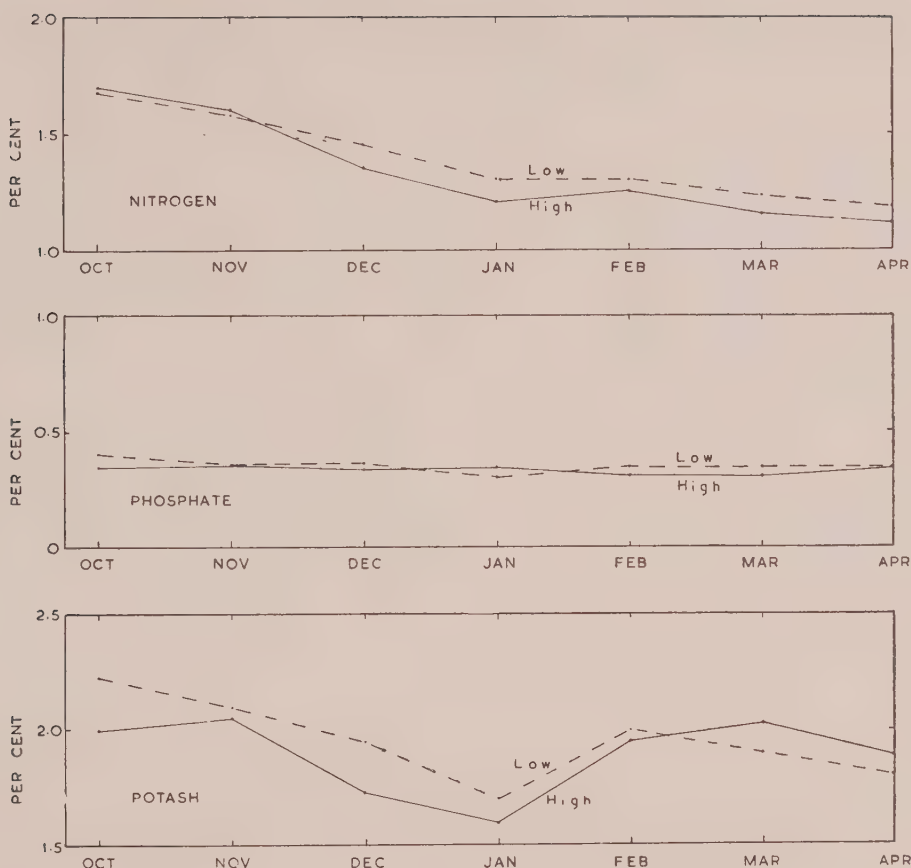


Fig. 11.

Leaf analyses—Babinda district. The nitrogen, phosphoric acid and potash contents of cane leaves from fields which produce cane with c.c.s. above mill average are compared with those from fields which are constantly below mill average. The unbroken lines (high) represent the above average fields at monthly intervals, while the broken lines (low) refer to the below average fields.

It was found that while kaolinite is by far the most widespread clay mineral found in these soils, mixed-layer minerals of two different types are important constituents in some of them. One, a trioctahedral mica-chlorite mixed-layer mineral, was present in most of the soils in the Mossman, Cairns and Innisfail districts. It is notable that this mineral did not occur in either of the two soils of basaltic origin which were examined from these areas; kaolinite was the only clay mineral detected in these.

The clay fraction of soils which make up both the ancient and recent alluvial terraces of the Burnett River near Bundaberg were found to

contain assemblages of clay minerals similar to the soils of the Burdekin delta and Mackay districts. These soils, which range from loams to silt loams and clay loams, are frequently characterised by a somewhat intractable nature and a generally poor physical condition. Kaolinite was again present in the clay fraction of all of these soils, but in this case it was associated with illite together with a mixed-layer mineral of illite and montmorillonoid interlayers, and allophane.

Nontronite (an iron rich montmorillonoid) was found to be the dominant clay mineral in a black clay loam soil developed on basalt at Maroondan in the Bundaberg district. Haematite, gibbsite,

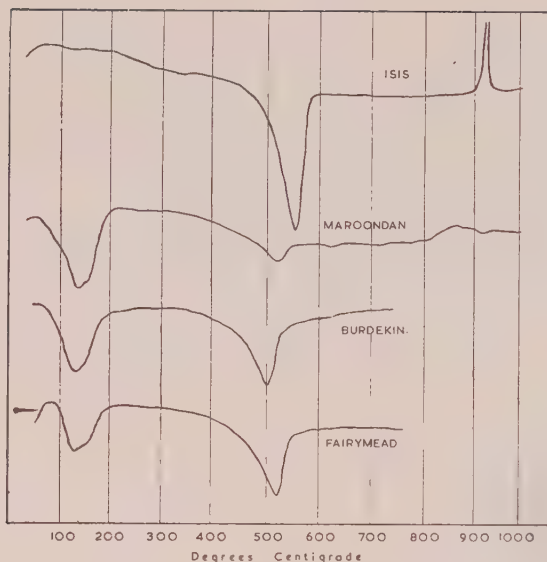


Fig. 12.

goethite and quartz spacings were also observed in the x-ray diffraction patterns of some of the soil clays examined.

Some typical thermal curves are reproduced diagrammatically in the accompanying figure in which the similarity between the Burdekin and Fairymead soils is readily seen. The red basalt soil from Isis shows characteristic kaolinite form which is in marked contrast to the Maroondan soil, also of basaltic origin.

Thermal curves of soils from four areas. Note the similarity of the curves obtained from the Burdekin and Fairymead soils. The curves from the two basaltic soils from southern Queensland show the marked contrast which is so apparent in their field appearance; the Isis soil exhibits a typical kaolinite curve whilst in the Maroondan soil nontronite is the dominant clay material.

Northern Sugar Experiment Station

(G. Bates, Officer in Charge)

Weather and Crop Notes

Early soil moisture conditions in 1953 were adequate for the young crop but a series of cold snaps slowed down growth somewhat in the winter months. A good fall of almost three inches in September, combined with warm conditions, resulted in a resumption of growth; the rain, being spread over seven days, allowed of little run off and the crops benefited accordingly. October, November, and early December were dry and canes began to show effects particularly on the drier red schists, volcanic, and sandy soil types. A precipitation of three inches on 19th December relieved the prevailing drought conditions and, with a registration of 416 points for the month, together with the light rain early in January and the onset of the wet season in the middle of the month, crops began to grow rapidly. The wet season rains were relatively light, being mostly at night with warm humid days. These conditions prevailed until early March when a sharp dry spell of about two weeks' duration occurred. Some growers commenced ploughing in green crops at this time and ploughed blocks were quite dry. No doubt this sudden drying off in rapidly growing blocks resulted in the pithiness and piping which is causing light truck weights during the current harvest. Further rain fell towards the end of March and continued in April and early May with occasional showers during June.

1953 Plantings and Germinations

Early planting for the 1954 crop commenced in late-March. A break of fine weather had enabled growers to plough in green manure crops and by early April land for early plant was in good condition. Just when large scale planting was about to commence rain fell delaying operations and growers had to either replough or bumper disc before being able to proceed. By late April planting had commenced

and, with good conditions in May, most of the early planting was completed in that month. June and July were particularly cold months and little planting was attempted. Fairly good strikes resulted and undoubtedly the use of mercurials was responsible to a large degree. Warmer conditions in August resulted in further plantings and during this month, September, and October all hot-water treated cane was planted.

As is generally expected early strikes were good and later strikes were much improved by the use of mercurials. Some poor strikes resulted from unexpected cold snaps and pineapple disease. However, the use of mercurials is becoming more general and little supplying was necessary.

Canes treated in hot water at the Experiment Station and mills gave erratic germinations particularly in July. Soil types, condition, and temperature, and also amount of cover applied appear to play a large part in successful germination of treated cane, the heavier soils reacting adversely, particularly under cold conditions. It was found that spraying or hosing down cane immediately after treatment tended to harden the eyes and reduce mechanical damage. Some good strikes resulted from this procedure.

1954 Planting Conditions

Rainfall during the year July, 1953-June, 1954, was 68.15 inches compared with the 30-year average of 74.06. In April the rainfall was heavier than usual, totalling 11.70 inches. This upset all early planting operations with the result that the amount of early planting done was meagre. The wet season rains lacked sufficient intensity to produce flooding of the Mulgrave River. Only one patch of windy weather was experienced and this was responsible for lodging in some heavy crops, but the

wind damage was not extensive. Owing to the continued dull weather during May and June, low c.c.s. figures characterised the start of the crushing season. Arrowing of cane was both free and early.

The following tables show the rainfall records taken at the Northern Sugar Experiment Station over the past 30 years and include details of other meteorological observations.

Rainfall Records at Northern Sugar Experiment Station for the Past 30 Years

Year	Rainfall in Inches	Year	Rainfall in Inches
1924-25 ..	82.86	1939-40 ..	82.10
1925-26 ..	49.02	1940-41 ..	80.59
1926-27 ..	80.34	1941-42 ..	41.55
1927-28 ..	72.46	1942-43 ..	64.60
1928-29 ..	92.83	1943-44 ..	52.92
1929-30 ..	69.99	1944-45 ..	120.34
1930-31 ..	75.62	1945-46 ..	63.95
1931-32 ..	61.87	1946-47 ..	35.24
1932-33 ..	90.02	1947-48 ..	69.12
1933-34 ..	119.09	1948-49 ..	85.77
1934-35 ..	58.22	1949-50 ..	83.50
1935-36 ..	87.64	1950-51 ..	67.68
1936-37 ..	49.54	1951-52 ..	52.86
1937-38 ..	53.28	1952-53 ..	83.98
1938-39 ..	126.79	1953-54 ..	68.15

Average for 30 years : 74.06 inches.



Fig. 13.
*Weighing a yield observation trial. The bipod
weigher can be seen in operation.*



Fig. 14.
*Loading a plot of a randomised trial at Meringa.
In the background can be seen a plot of Co.475
(left) and one of J.204 (right).*

**Abstract of Meteorological Observations made at Northern Sugar Experiment Station, Gordonvale, from
1st July, 1953 to 30th June, 1954.**

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Tempera- ture 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.		
			Maximum			Minimum							
			High	Low	Mean	High	Low	Mean					
1953													
July	..	..	1.63	13	84	75	79.5	65	48	57.6	21.9	67.9	84
Aug.	..	..	0.81	7	90	74	82.0	69	38	55.9	26.1	68.9	85
Sept.	..	..	2.97	7	89	76	83.5	68	46	59.5	24.0	73.9	76
Oct.	..	..	0.16	2	95	84	91.1	72	51.5	59.2	31.9	80.0	70
Nov.	..	..	0.78	9	95	83	92.8	75	62	69.5	23.3	83.9	68
Dec.	..	..	4.16	10	96	84	92.8	77	61	71.2	21.6	84.1	71
1954													
Jan.	..	..	17.46	19	96	82	90.8	76	67	72.9	17.9	82.2	83
Feb.	..	..	15.66	18	95	79	90.7	76	73	74.5	16.2	82.0	87
March	..	..	10.39	18	94	81	89.6	76	64	71.2	18.4	80.0	87
April	..	..	11.70	24	91	81	85.6	74	62	69.9	15.7	77.4	91
May	..	..	1.51	11	87	77	82.3	70	54	63.7	18.6	72.7	85
June	..	..	0.92	8	86	74	78.9	68	50.5	60.6	18.3	70.0	80

EXPERIMENT STATION OPERATIONS

Seedling Raising and Selection

Fuzz was planted in the glasshouse at the end of July and subsequently 8,414 original seedlings were planted to the field at the end of October.

Seedling selection in the 1952 original "N" seedlings resulted in the selection of 155 seedlings which were planted in 30-sett plots. In addition the following varieties were included in the 30-sett plantings: B.4098, B.41211, B.41227, Co.213, Co.385, C.P.36/138, C.P.43/47, C.P.44/155, M.336, P.R.902, P.R.905, H.35-198, H.36-7913, H.39-5803, H.44-2364, H.40-1184, H.34-3171, H.47-2910, Pepe Cuca, 45 M.Q.3205, Q.51, Q.55, and 82 varieties from the 1951 New Guinea collection.

Yield Trials with Seedlings

From the 40-sett ratoons of the previous year ("L" series) 28 varieties were planted out in a yield-observation trial, together with

P.O.J.3016, 36 S.N.4995, 38 S.N.473, and Mowbray Seedling, Pindar being used as a standard.

From the first ratoon yield-observation trial of "J" and "K" seedlings, four "J" seedlings and Co.475 were planted in a randomised block trial using Pindar as a standard, while those showing exceptionally high sugar were planted out for trial on good land. The varieties selected for the randomised block trial were—J.204 (Badila x Q.27), J.238 (Co.270 x Comus), J.301 (S.J.4 x Comus), and J.330 (Co.270 x J.B.3).

Seedling Work at Babinda

Further propagation was continued at the sub-station located at Babinda, 86 seedlings being planted out in 40-sett plots.

Variety Introductions

The following varieties were received from Brisbane quarantine house either for breeding work or for trial as possible commercial



Fig. 15.

Portion of Meringa Sugar Experiment Station in the Mulgrave mill area. This is the centre of the Bureau's cane breeding activities.

varieties: C.4-6, F.31-962, F.36-189, F.31-426, E.P.C 38-304, C.P.33/409, C.P.48/103, U.S.48-34, Cl.41-142, Fiji 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, and 31.

Experiments Harvested During the Year

Four seedling trials were harvested during the year. These consisted of a plant trial in the form of a randomised block, a first ratoon randomised block, a plant yield-observation trial, and a ratoon yield-observation trial.

In the plant randomised block the varieties I.213, I. 216, I.252, J.211, and J.225 were compared with Pindar, the trial being harvested at 13 months. Pindar, producing 6.48 tons of sugar per acre, was significantly better than all other varieties with the exception of I.216 which produced 6.25 tons of sugar per acre. The trial will be carried through to the first ratoon crop. I.216 is a seedling from Trojan and P.O.J.2878.

In the ratoon randomised block, I.222, I.235, I.245, H.231, and H.360 were compared with Trojan. The results obtained in the plant crop in 1952 were confirmed in the ratoons. I.222, I.235, I.245, and Trojan were comparative in performance, there being no significant difference in tons of sugar per acre; all were better than H.231 and H.360. I.245 has poor cover and tends to lodge somewhat, but I.222 and I.235 are being further propagated on farms. The lastmentioned, a Q.44 x Comus seedling, is inclined to be somewhat thin; it is a good striker and ratooner and the early sugar is satisfactory. I.222 is a thick cane from Pompey x Q.39; its early sugar is good and the habit of growth suits local harvesting conditions.

In the plant yield-observation trial, 37 "K" seedlings were compared with Pindar. When harvested many had very high sugar but the tonnage was disappointing. Few canes equalled Pindar in sugar per acre. This trial will be continued to first ratoons before selection.

In the ratoon yield observation trial, 21 varieties from the "J" series seedlings, 5 "K" series seedlings, P.O.J.2961 and M.63-39 were compared with Pindar. The best of the "J" series were carried forward to a randomised block, while the "K" seedlings which produced



Fig. 16.

Meringa Experiment Station variety display at Cairns Show.

very high sugar and poor tonnage on the poor soil on which they were growing were planted on good land for further trial.

Breeding Cane Collection

The variety garden was maintained and there is now a total of 496 varieties growing on the station exclusive of the 8,414 "N" series original seedlings, 155 "M" series, and 157 "L" series seedlings in 30-sett plots.

Legumes

In extending the search for wilt-resistant legumes for cover crops a planting was made to include C.P.I.9247, C.P.I.9248, C.P.I.11044, C.P.I.12377, with Mung bean, Cristaudo pea, Poona pea, and Reeves' Selection as standards. Poona pea, C.P.I.9247, C.P.I.9248, and Cristaudo pea showed little resistance to wilt, the two best varieties from this aspect being C.P.I.11044 and C.P.I.12377. C.P.I.11044 vines much more than C.P.I.12377 and produces a denser crop, but C.P.I.12377 is a much more sturdy looking plant. Both of these varieties appear to be worthy of further trial.

Hot-water Treatment

During the past twelve months a considerable amount of hot-water treatment of plants was performed in an endeavour to combat ratoon stunting disease and provide clean seed for further plantings. Early treatments were

carried out at 52°C. for two hours, but due to heat sensitivity of some varieties the temperature was later reduced to 50°C. which had been shown to be effective. Stocks of 122 parent canes were treated as well as plants of the "K" series seedlings used in the yield observation trial and the three "J" varieties used in the randomised block.

Planting commenced on 20th May and, unfortunately, the heat treatment caused many poor germinations in the 122 parent canes as well as all other plots and some replanting had to be carried out. The plants were treated in corn sacks which impeded the circulation of hot water and arrangements have now been completed for all cane treated in future to be packed in wire-netting cages. This, coupled with improvements in the circulation of water in the tank, should render the treatment and the subsequent germinations more effective. It is found with hot-water treatment that cane germination is sometimes slow, and plants should be given every chance of survival by having the soil in good condition and applying very little cover to the setts.

Weedicide Investigations

One trial was set out to compare a formulation of emulsifiable pentachlorophenol in creosote with a similar formulation which contained, in addition, 2,4-D. As both sprays contained the same quantity of pentachlorophenol (1 lb. per gall.) they were applied at the same rate per acre. Applications were made at two, four, and six gallons per acre on young weeds and grass. While in each case the higher rates per acre gave better results, the formulation containing 2,4-D was much superior to the other.

Trials were also set out to compare different forms of 2,4-D and the following types were used—dimethylamine salt, diethanolamine salt, butoxy ethanol ester and the sodium salt. Two trials were of the pre-emergence type while one was conducted against growing nut grass. All sprays were applied at the same rate of active ingredient, equal to 4 lbs. per acre of the sodium salt.

In the nut grass plots all surface nut grass was killed but very little difference could be noticed between treatments although it appeared that the dimethylamine compound



Fig. 17.

Planting a yield observation trial. Note bundles of cane setts on ground and the light compaction roller behind the planter.



Fig. 18.

The bipod weigher in use on experimental plots at Meringa.

may have persisted for the longest period; but the difference was only slight.

The pre-emergence plots showed practically no difference between treatments. In one trial the sodium salt appeared slightly inferior to the other compounds but this observation would need confirmation.

Annual Field Day

Field Day was held on 13th May under ideal weather conditions, and there was an attendance of approximately 400. Visitors were conducted over the station by members of the Bureau staff who explained the work being performed. There was a large display of tractors and implements.

Laboratory Work

The following is a summary of cane samples handled during the year:—

Station and trial samples	..	1,325
Farmers' cane samples	..	34
		1,359

Summary of Crops Grown on the Station

Parent Canes and trials (including that used for plants, etc.)	..	436.39 tons
Original seedlings	.. ..	90.29 ..
		526.68 ..

Plant cane harvested for mill (including that sold through mill for plants)	.. .. .	292.03 tons
Ratoon cane harvested for mill..		192.15 ..
Cane used in breeding work, c.c.s. samples, plants for station and other experimental plots	..	42.50 ..
		526.68 ..

Area of plant cane harvested	..	11.3 acres
Area of ratoon cane harvested	..	8.5 ..
		19.8 ..
Average tons per acre	.. . .	26.6

Lower Burdekin Sugar Experiment Station

(G. A. Christie, Officer in Charge)

Notes on Weather and Crops in the District

Winter, spring and early summer of 1953 gave very little rain, the last six months of 1953 yielding only 4.89 inches on 11 wet days. Such conditions are normal for the Burdekin area, where practically all of the annual rain is measured during the months of January, February and March. Scattered storms early in January, 1954, interfered slightly with harvesting of the record Burdekin crop, but wet season conditions did not set in until the second half of January, extending through February and into the second week of March. The following dry period permitted land to be prepared for 1954 planting, and in many places, planting had been commenced, to be interrupted by rain during the first three weeks of April. No rain fell in May, and a few light showers in June were of little benefit, but caused no appreciable interruption in routine work.

The February, 1954 Cyclone

The most notable feature from a meteorological viewpoint was the development of a cyclonic centre and its south-easterly passage across the coast in the vicinity of this district on 7th February, 1954. The lowest corrected barometric pressure was recorded at 6 p.m. on that date, the figures being 29.267 inches. Gale force winds, first from the south-east and later from the north-west, flattened some advanced cane crops, and broke many tops from the brittle variety Pindar, and to a lesser extent from Comus. Rain associated with the disturbance brought about flooding of the Burdekin River and low-lying fields were inundated with water, which, in some localities, resulted in further cane losses.

In spite of some wind damage, crops for 1954 harvest are generally good, though sugar content appears to be lower than normal, due

possibly to the effects of the cyclone and to the long period of overcast weather which accompanied the wet season. Reduced hours of sunlight during the early part of 1954 may also have induced the development of a greater number of arrows than is commonly found in the Lower Burdekin. Crops planted in autumn, 1954, were generally slow to germinate, for, following the extended wet season, most of the planting was carried out during the month of May when cool conditions prevailed.

Small Crop Losses from Insects and Animals

White grub damage was again negligible, due to small beetle flights, and to the use of BHC in areas previously affected. Rat damage has been a little heavier than normal, though the extent of cane loss in the area would be in areas adjacent to grazing land and similar very low. Slight damage by wallabies occurred losses may be attributed to coots in fields near lagoons and watercourses. Spot damage from giant termites has also been noted.

Ratoon Stunting Disease Control

Following the establishment of clean seed plots in 1953, efforts to control ratoon stunting disease have proceeded with increased tempo during the past year. Cane Pest and Disease Control Boards in the Lower Burdekin and Giru areas made stocks of clean cane available, to enable cane growers to establish clean sources of plants for their future plantings. Plant distribution was carried out very successfully and many growers used clean cane for their entire planting in 1954, while a surplus in one area was used in other districts to establish or augment plots of disease free cane. It is generally believed that the clean seed has given a more rapid germination and early growth than plantings of untreated cane under similar conditions.

Mosaic Disappearing

A small amount of mosaic disease may still be found on a few farms, though this is being eliminated by a careful selection of plants, removing diseased stools, and the reduction in the

area planted with more susceptible varieties.

Abstract of Meteorological Observations made at the Lower Burdekin Sugar Experiment Station, Brandon, from 1st July, 1953, to 30th June, 1954:—

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Tempera- ture 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1953											
July	—	—	82	74	78.7	56	40	48.5	30.2	67.7	59.9
August	2.10	2	88	66	79.7	62	43	52.8	26.9	66.7	63.5
September	—	—	87	80	82.9	66	48	56.4	26.5	70.4	63.3
October	1.70	2	90	84	86.5	72	54	64.0	22.5	80.4	63.2
November	.56	2	94	88	89.7	76	60	69.0	20.7	84.3	59.4
December	.53	5	96	88	90.5	76	64	70.0	20.5	87.0	56.6
1954											
January	11.65	11	96	82	88.7	75	68	71.9	16.8	82.7	73.3
February	23.13	17	96	82	88.7	80	72	75.0	13.7	83.0	81.7
March	8.14	8	92	80	88.4	76	66	71.0	17.4	81.0	76.6
April	6.95	11	88	76	84.3	73	62	67.1	17.2	77.2	77.1
May	—	—	86	77	82.1	64	50	57.5	24.6	71.2	72.7
June	.58	3	83	65	77.2	62	42	54.2	23.0	65.8	71.3
Totals	55.34	61									

EXPERIMENT STATION OPERATIONS

Seedling Raising and Selection

Some original seedlings had been planted out before the end of June, 1953, and this was completed in July when the total number established was 6,240 seedlings representing 29 bi-parental crosses. An inspection of these seedlings in June, 1954, resulted in the selection of 80 varieties which will be planted out in 40-sett plots for comparison with standards of the district.

Progressive Seedling Trials

The 1953 selection of "N" series seedlings resulted in 80 being planted out in 40-sett plots. In the same planting were included 74 of the 1951 New Guinea canes, seven varieties from quarantine (M.336, P.R.902, P.R.905, H.39-5803, H.47-2910, Q.51, and Q.55), as well as ten varieties from the district isolation plot (I.231, I.242, I.244, I.252, I.275, I.302, J.211, J.337, Ragnar and Mowbray Seedling).

In the following year, 1954, 32 of these were selected for planting in a yield observation trial. They were 25 of the "N" seedlings, M.336, I.244, I.275, I.302, J.211, Ragnar and Mowbray Seedling.

Selection from the yield observation trial of "M" (Burdekin) and "I" (Northern SES) seedlings has been deferred until next year when the yields from the trial and maturity testing figures will be a useful guide in selecting suitable types. Similar conditions apply to the four "L" series seedlings in the randomised block trial planted in 1953.

A yield observation plot containing 31 Burdekin "L" series seedlings and three "H" series seedlings from the Northern Experiment Station showed that eleven seedlings were superior to the standard in yield of sugar per

acre. Some of these canes were considered unsuitable because of undesirable agricultural features such as prominent buds, poor cover, etc., and four only were planted in a randomised block trial for further comparison with standards. After harvest, this field was ratooned in order to obtain further information on the ratooning ability and yield of all varieties.

Propagation plots of the many seedlings and introduced varieties in different stages of trial have yielded useful information on the characteristics of these varieties, which will be used in assessing their suitability for local conditions.

Since no stocks of viable seed were available earlier, seedling raising in 1954 will be much later than in previous years, and the glasshouse on the Lower Burdekin Station will be used for the first time for this work.

Effects of Benzene Hexachloride on Cane Growth

A BHC toxicity trial to determine the effects of different amounts of crude BHC and the refined gamma isomer was harvested, and the trial showed no significant differences due to treatments. The trial which averaged 72.12 tons of cane per acre, was ratooned and retreated with suitable amounts of BHC, to permit further investigations into this subject.

Ratooning Investigations

A long range trial had been established on this Station to investigate the economics of growing first and/or second ratoons as opposed to growing plant cane only; this incorporated several cane varieties. Since it was planted the implications of ratoon stunting disease threw doubts on the trial since the plants used could possibly have been infected. It was decided to plough out the entire trial and to replant it with disease-free plants so that no other factor would have a bearing on the results. The



Fig. 19.

The display of tractors and implements on Field Day at the Experiment Station.

Lower Burdekin cane growers, for some reason which is not clear, grew less ratoons than any other district. The purpose of this experiment is to demonstrate the type of ratoon crops grown, and to compare the net returns from various rotations.

Variety Introduction

In 1953, four varieties, viz., Q.56, Q.58, E.129, and 45 M.Q.3205, were forwarded from Brisbane quarantine house, and these have been propagated for inclusion in the next planting of 40-sett plots.

Varieties forwarded from the Northern Sugar Experiment Station have been maintained at the Clare isolation plot, prior to being transferred to this Station for planting in 40-sett plots. Regular inspections have shown no disease symptoms in any variety.

Plant Distribution

The variety Q.57 was added to the lists of varieties, approved for planting in the Lower Burdekin and Giru areas, and its release for general planting was arranged through the local Cane Pest and Disease Control Boards.

Field Day

Field Day which was coupled with the official opening of the Station on 10th June, 1954, when wet and cool weather provided most unfavourable conditions for the function. However it is estimated that between 250 and 300 visitors attended to hear addresses by the Chairman and members of the Sugar Experiment Stations Board, the Director, and others closely connected with the sugar industry, to inspect the Station, and to be present at the opening. Short addresses were delivered to the gathering by the Chairman of the Sugar Experiment Stations Board (the Hon. H. H. Collins), the Deputy Chairman (Mr. A. F. Bell), the Director (Mr. Norman J. King), the Chairman of the Cane Growers' Council (Mr. B. Foley), and Mr. E. R. Behne (on behalf of the President of the Australian Sugar Producers' Association).

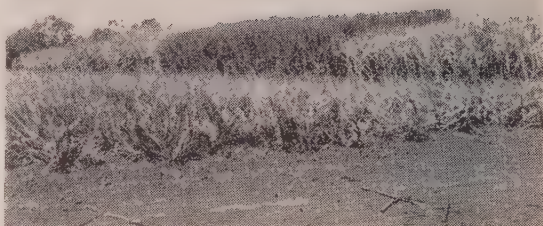


Fig. 20.

A varietal trial on the Station.

Laboratory Work

The following is a summary of the c.c.s. analyses carried out during the year:—

Station	229
Farm Trials	103
Farmers' Samples	11
Total	343

Summary of Crops Grown on Station

Varieties harvested during 1953 season—

Trojan	403.77 tons
Pindar	41.62 "
S.J.16	141.88 "
Comus	43.62 "
Badila	124.04 "
Experimental Varieties	566.64 "

Total .. 1,321.57 "

Plant cane harvested .. 1,204.16

First Ratoon cane harvested .. 117.41

Total .. 1,321.57

Total cane harvested for mill .. 1,321.57

Used for samples, plants, etc. .. 37.5

Not harvested due to wet weather .. 35.0

Total Crops .. 1,394.07

Total acreage harvested .. 28.22 acres

Average tonnage per acre .. 49.40 tons

Central Sugar Experiment Station

(C. G. Story, Officer in Charge)

Notes on Weather and Crops in the District

Dry conditions were experienced in the central district during July and until the 28th August, 1953, when excellent general rainfall up to 4½ inches was experienced. This occurred at an opportune time, benefitting all crops in the area and ensuring the basis of the 1954 crop. Lighter falls had been experienced in some sub-districts earlier in the month. Unexpected cyclonic winds on August 5th damaged approximately 20,000 tons of cane in an area from Koumala to Oakenden, but fortunately this cane was removed before the rainfall and there was no marked deterioration in c.c.s. Frost was recorded on four nights in July and two in August.

Young plant and ratoons made excellent progress in September following the rain, and cane on planted blocks germinated well with the good soil moisture and increasing temperatures, but by the middle of October rain was required in the area. Storm rains from the 24th to 26th October ended two months of dry weather but the rain was scattered and some areas did not benefit.

Rainfall was below average during November. Days were hot and sultry with temperatures over 90 degrees on nine days, and strong winds and high temperatures were distressing to the cane by the end of the month. Typical summer conditions were experienced in December and by the end of the month the whole district required steady soaking rain. Young cane on the heavier clay soils was in better condition than on the lighter soil types and cane on later ratooned blocks did not suffer to the same extent as that on the earlier cut ones, but all cane was backward and showed the effects of the weather experienced during the last fortnight of the year when the countryside was parched from high temperatures, drying winds, and lack of soil moisture. This condition continued until the 13th January when a heavy wet season deluge commenced and the district received more than half of its average annual rainfall in a fortnight. The annual rainfall for 1953 at the Experiment Station was 5793 points recorded on 86 days, and from the 1st July to 31st December only 939 points were received on 21 days.



Fig. 21.

Applying bagasse to the soil at Mackay Station.

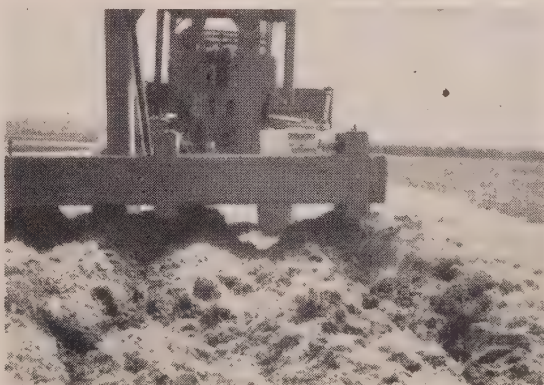


Fig. 22.

After spreading, a ripper was worked through the bagasse to a depth of 22 inches. The bagasse could be seen running down the gashes made by the ripper tynes.

The torrential rainfall which occurred on ten days in January, 1954, flooded portion of the Station on two occasions, and parts of the district were waterlogged, particularly new cane areas. The whole district received heavy rainfall for February, and cyclonic winds during the second week caused district flooding in Mackay and Proserpine. Crops made excellent progress on well drained land but on areas which remained waterlogged for long periods cane crops were adversely affected, and hot sun on the ponded water helped to kill backward cane.

A cyclonic rain front deluged Proserpine on the 6th and Mackay on the 7th March, and crops made excellent progress with the strong sunshine and the comparatively drier period for the last three weeks of the month; the good growing conditions extended into April and dur-

ing this and the following month it was apparent that a heavy arrowing season was to be expected.

Annual Rainfall since 1935 at the Experiment Station, Mackay

Year	Rainfall (Inches)	Year	Rainfall (Inches)
1935-36	99.57	1945-46	68.52
1936-37	64.21	1946-47	48.09
1937-38	47.21	1947-48	38.40
1938-39	61.29	1948-49	46.95
1939-40	82.86	1949-50	85.48
1940-41	73.71	1950-51	107.63
1941-42	57.75	1951-52	41.68
1942-43	76.13	1952-53	56.58
1943-44	58.67	1953-54	102.57
1944-45	33.53		

Average for 19 years — 65.83 inches.

Abstract of Meteorological Observations made at The Central Sugar Experiment Station, during period 1st July, 1953 to 30th June, 1954.

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Tempera- ture 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1953											
July	0.15	3	79.5	70.0	74.2	59.0	36.0	46.0	28.2	63.08	72.35
August	4.71	4	87.5	65.5	74.9	64.5	35.5	49.7	25.2	66.51	65.01
September	0.11	1	83.5	75.5	78.1	64.5	48.5	56.3	21.8	72.60	61.46
October	1.77	4	90.5	79.5	84.8	71.5	52.5	62.0	22.8	79.12	63.08
November	1.19	5	92.0	82.5	87.5	75.0	56.5	68.8	18.7	82.90	58.13
December	1.46	4	94.5	85.0	89.8	77.5	61.0	68.8	21.0	84.64	57.90
1954											
January	37.77	18	92.5	78.5	84.9	76.0	64.0	70.9	14.0	80.48	75.93
February	22.34	22	94.5	81.5	86.3	77.0	68.5	73.9	12.4	80.73	83.94
March	14.85	13	89.5	76.5	85.2	74.0	64.5	69.1	16.1	79.80	78.85
April	16.64	25	84.5	71.5	79.9	71.0	62.5	67.5	12.4	75.01	83.08
May	0.64	5	81.0	64.0	76.8	66.5	43.5	57.8	19.0	69.10	74.38
June	0.94	8	82.5	63.5	72.8	64.0	36.0	52.9	19.9	64.31	74.81
Totals	102.57	112									

Mercurial Spraying Plants

The number of spraying units attached to cutter-planters increased considerably during the year. These attachments spray the cut plants with an organic mercurial solution during their passage down the planter chute. By this means the plants are protected against the pineapple disease organism as well as benefitting from the germination stimulation properties of the mercurial.

Field Applications of Molasses

Cane growers in some mill areas are able to obtain molasses for fertilizing purposes and advantage was taken of its availability; applications were in the vicinity of six tons per acre. This plant-food-rich material is valuable on soils where potash deficiency exists, but requires supplementing with superphosphate where available soil phosphorus is low.

Hot Water Treatment of Cane Plants

The Mackay and Plane Creek Cane Pest and Disease Control Boards carried out a vigorous campaign of hot water treatment against ratoon stunting disease during the spring of 1953. In all, sufficient cane to plant 289 acres was treated and it is estimated that some 6000 tons of clean plants will, as a result, be available for 1954 planting.

Striga and 2,4-D

The cane killing weed, *Striga*, was reported and identified on several areas of new land. Although the incidence of the pest was low, control measures with 2,4-D were instituted. Good control is effected with this weedicide at an application strength of one pound per acre.

New Chlorotic Streak Disease Finding

During the year chlorotic streak, never previously recorded in the central area, was found at both Plane Creek and Mackay. In the latter district the disease is reasonably widespread but is restricted to low-lying, badly drained sections of the district.



Fig. 23.

Random samples taken from bagasse trial after 12 months. Six stalks from area ripped and bagasse treated weighed 20½lb, from ripped area 16lb, and from control area 10½lb.

EXPERIMENT STATION OPERATIONS

Annual Seedling Selection

Selection of the "N" series seedlings planted in the field during 1952 resulted in 101 being carried forward for vegetative reproduction and comparison with standards. At the same time 77 canes of the 1951 New Guinea collection and 13 varieties introduced from elsewhere were included in the planting; the latter comprised B.37161, B.4098, B.41211 and B.41227 from Barbados, C.P.43/47, C.P.43/64 and C.P.44/155 from Canal Point, H.39-5803 and H.47-2910 from Hawaii, P.R.902 and P.R.905 from Puerto Rico, and Q.51 and Q.55 from quarantine in Queensland.

Progressive Seedling Trials

Twenty-four of the "L" series seedlings, and three introduced varieties, F.108, P.O.J.3016 and 38S.N.473, were selected from first ratoon 40-sett plots, and planted in a yield observation trial against Q.50.

In the yield observation trial planted the previous year and harvested in 1953, were 20 "K" series seedlings together with Co.331, P.O.J.2961, P.O.J.2967, 41S.N.3339, 41S.N.3621 and Q.57. At harvest none was better than the standard Q.50 in tons of sugar per acre.

The "J" series seedlings had been planted in 1952 in a randomised trial with Q.50 and Q.58. At harvest time in 1953 there were no significant differences in cane per acre and the only variety with markedly reduced sugar per acre was J.132 which had a high incidence of red rot.

Seedling Trials at Alexandra

The Alexandra sub-station allows of selection and progressive trials on the richer alluvial soil type. Here in a first ratoon yield trial which was harvested at 10½ months of age only two varieties failed to outyield the standard, P.O.J.2878, in sugar per acre. Seven

of the selections from this trial, which included "H", "I" and "J.P." seedlings, were replanted in a replicated layout.

Nitro-chalk versus Sulphate of Ammonia

As the result of some interest being revived in nitro-chalk in a granulated form, a field trial was designed to assess its value compared with sulphate of ammonia as a nitrogenous fertilizer. The plant crop showed no significant difference in yield. However, the rapid deterioration of the nitro-chalk in storage under the humid, tropical conditions made it very unattractive as a substitute or replacement fertilizer.

The value of Long Fallowing

In a long range experiment on this Station comparisons are made between normal cane growing procedure (one plant and two ratoon crops with a six month fallow), four-year grass fallow before planting with cane, two years grass fallow plus six months legume fallow, and two and a half years perennial legume fallow. Following the necessary preparatory fallows all plots were planted simultaneously with cane in August, 1952, and harvested twelve months later. The treatments, in the order given above yielded 30, 45, 39 and 40 tons per acre respectively, demonstrating the effects of the long fallows. Future results from the first and second ratoon crops will allow a better assessment of the persistence of the treatments. Such information may be of value in the event of restrictive measures being introduced in the future.

Rock Phosphate versus Superphosphate

Another long term trial was harvested for the first time in 1953. In this experiment the value of superphosphate is compared with finely ground rock phosphate. It is desired to discover whether, in this acid soil, decomposition of the rock phosphate will be sufficiently rapid to provide crop requirements. The first comparative applications were made to first ratoon cane and in the resultant crop no significant differences were measurable. It is possible that there was sufficient carry-over available phosphate to fill the needs of the crop.

Krilium — the Soil Conditioner

On the block of this Station where a Krilium application was made the soil is intractable and dries out after rains into hard, large clods. This soil conditioner was broadcast at 400 lb. per acre and was disc harrowed to a depth of four inches in December, 1952. In the following month heavy rains caused inundation of the block for short periods and the land was not ploughed until October, 1953, when considerable differences were noted in soil structure and ease of ploughing. Determination of water staple aggregates showed 38 per cent. in the treated area and 15 per cent. elsewhere. The improvement in tilth was still very evident in June, 1954.



Fig. 24.

The Krilium trial on Mackay Station. Above the untreated soil, and below the adjacent treated soil after applying 400lb. per acre.



Fig. 25.

Trial With New Legumes

A number of legumes of the cowpea type was planted in a comparative trial for assessment regarding wilt, bean-fly resistance, and yield. These included Reeves' Selection, Poona pea, C.P.I.9247, C.P.I.9248, C.P.I.11044 and C.P.I.12377. The planting site was flooded several times during the following wet season. Results were inconclusive, but C.P.I.9247 appeared to be the best. Further plantings will be made this year.

Other observations suggested that Pigeon pea (*Cajanus bicolor*) may have value as a green manure crop in the Mackay district.



Fig. 26.

New legumes under trial; in foreground C.P.I. 9247 and in rear C.P.I. 12377.

Variety Introduction

The only cane to be introduced from quarantine was Luna.

Extension of Weedicide Investigations

The previously reported successful work with the sodium salt of 2,4-D on nut-grass (*Cyperus rotundus*) was extended to the butoxy ethanol ester of 2,4-D with excellent results; the rate of application was the equivalent of 1lb. per acre sodium salt with 83 per cent. active ingredient.

The work with sodium trichloroacetate on Guinea grass (*Panicum maximum*) was also continued.

It was established that this vigorous plant could be killed by 100 lb. per acre of the weedicide and that two applications of 25 lb. per acre each also gave good results. Eradication is assisted materially by first mowing the old crop, or by spraying with sodium pentachlorophenate (at 20 lb. per acre) and then burning, prior to spraying the trichloroacetate onto young regrowth. Para grass (*Brachiaria mutica*) is also amenable to treatment with this material at 50 lb. per acre, but at half this quantity some 30 per cent. of the plants recovered within six months.

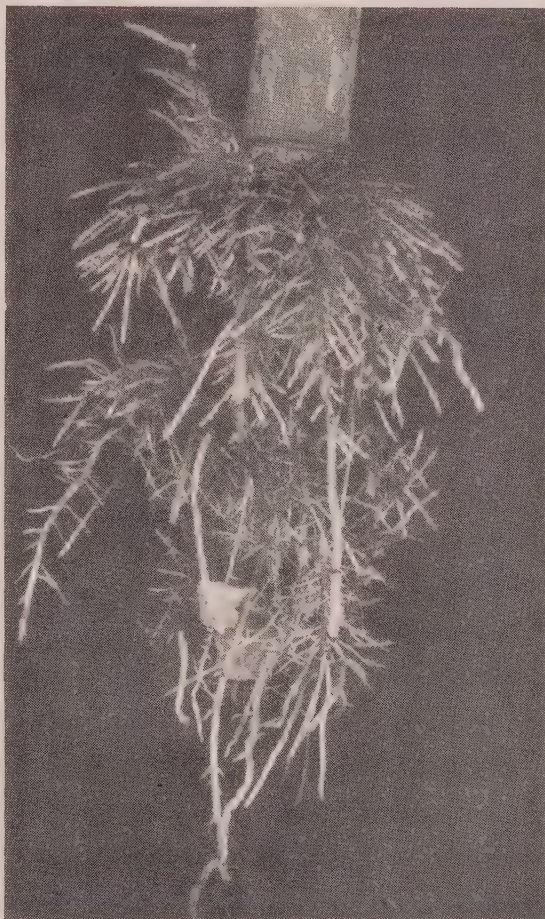


Fig. 27.

Adventitious rooting on stalk of an original seedling caused by late application of 2, 4-D.

Sensitive weed (*Mimosa pudica*) was killed by the 40 per cent. mixed esters of 2,4-D and 2,4,5-T at half a gallon per acre.

Bagasse as a Soil Ameliorant

The surplus bagasse in the industry prompted the experimental usage of that material as a conditioner for intractable and badly drained soils. On this Station bagasse at 30 tons per acre was spread on the field and the land was ripped twice to a depth of 22 inches. On another section the ripping was performed without bagasse treatment. These were compared with normal cane growing procedure. It is anticipated that the bagasse which flowed down the ripper gashes will initiate quicker water penetration after heavy rain and will allow deeper rooting. Quicker drainage on these soils will be valuable in allowing earlier cultivation.

Annual Field Day

On April 30th, 1954, some 600 cane growers, mill executives and Pest Board members visited the Station and were conducted on tours of the blocks. Considerable interest was apparent in the internal symptoms of ratoon stunting disease which were demonstrated by a pathologist.

Laboratory Work

The following is a summary of the c.c.s analyses carried out during the year:—

Experiment Station ..	988
Farm Trials	553
Farmers' Samples ..	189
Show Canes	21
	1751

Summary of Crops Grown on the Station

Varieties harvested during 1952 Season:

	Tons
Q.50	450.58
Seedlings	287.25
Total	737.83
Plant Cane Harvested	541.18
First Ratoon Cane Harvested ..	196.65
Total	737.83
Total cane harvested for mill ..	737.83
Used for samples, plants, farm propagation and trials	42.35
Q.58 sold for plants	26.64
Total crops	806.82
Total acreage harvested	29.57 acres
Average tonnage per acre	27.28 tons

Southern Sugar Experiment Station

(H. G. Knust, Officer-in-Charge)

The 1953 Harvesting Season

Following the favourable growing season which was responsible for the record 1953 crop the winter months of that year were relatively mild. Eleven frosts were recorded during July and August but only moderate damage was occasioned to millable cane in the low lying lands of the Bingera and Gin Gin areas. The frosts were, however, sufficiently severe to affect the young autumn plant cane which was three to four months old, and much of this was killed to ground level.

The first of the southern mills began crushing operations on June 23rd, and by July 15th all except Rocky Point were functioning. Although the limited frost damage—and to some extent the dry winter—reduced tonnages below early estimates, the Bundaberg-Isis districts aggregated 1,417,154 tons of cane with an out-turn of 173,992 tons of 94 n.t. sugar. Both figures constituted records.

In August, 1953, some relief rain broke the dry spell which had characterised the winter months and this change brought about an improvement in ratooning of early harvested crops; up to that time the emergence of ratoon shoots had been slow and sparse. September was dry, but in October the rainfall was well above normal and ratoons made rapid growth with the increasing temperatures.

There was no excessive lost time during the harvesting season due to weather conditions and all mills in the southern area had completed their crushing operations by December 31st with the exception of Millaquin where the season terminated on January 8th, 1954.

The 1954 Growing Season

As mentioned above the 1953 autumn planted cane was, in many areas, killed back by winter frosts. Nevertheless, recovery was rapid and development was assisted by good spring rains in August and October. Spring planted canes benefited from the same rainfall and ratoons from crops harvested in 1953 made steady, increasing to rapid, progress. Good germinations marked the spring plantings and no serious growth checks were experienced by any of the crops until late March, 1954. March and April were exceptionally dry, the aggregate rainfall being only 2.72 ins., and much high temperature weather was lost so far as crop development was concerned.

Earlier crop estimates had necessarily to be revised downwards because of the deterioration in growth conditions, and although rains fell in late May they coincided with lower temperatures and did not promote new growth. Even in the irrigated lands of South Kalkie the dry period had serious effects since many pumps were still submerged as a result of earlier heavy rains. The net result was a crop expectation slightly lower than for 1953 although there is some reason to believe that the sugar output may be higher. Winter conditions to time of writing have been mild and no frost damage has occurred.

The autumn weather conditions have apparently favoured arrow emergence. Early in May they began to appear along the coastal fringe of the district, and by late June the flowering of C.P.29/116 was fairly heavy throughout the area.

Rainfall Records at the Southern Sugar Experiment Station, Bundaberg, 1914-1954.

Year	Rainfall Inches	Year	Rainfall Inches
1914-15	31.99	1934-35	40.01
1915-16	28.54	1935-36	44.24
1916-17	58.08	1936-37	31.65
1917-18	49.85	1937-38	44.40
1918-19	24.24	1938-39	41.01
1919-20	28.20	1939-40	41.69
1920-21	45.16	1940-41	43.26
1921-22	44.97	1941-42	33.52
1922-23	37.14	1942-43	40.75
1923-24	34.16	1943-44	45.22
1924-25	50.96	1944-45	28.14
1925-26	37.62	1945-46	26.10
1926-27	68.18	1946-47	44.52
1927-28	74.69	1947-48	57.76
1928-29	31.16	1948-49	40.18
1929-30	43.16	1949-50	59.31
1930-31	47.19	1950-51	50.74
1931-32	22.88	1951-52	40.42
1932-33	36.81	1952-53	48.99
1933-34	71.45	1953-54	45.81

Average for 40 years: 42.85 inches

Abstract of Meteorological Observations made at the Southern Sugar Experiment Station, Bundaberg, from 1st July, 1953 to 30th June, 1954.

Month	Rainfall (Inches)	No. of Wet Days	Shade Temperature						Mean Diurnal Range	Mean Tempera- ture 9 a.m.	Mean Per Cent. Relative Humidity 9 a.m.
			Maximum			Minimum					
			High	Low	Mean	High	Low	Mean			
1953											
July	0.06	2	77	64	71.7	54	34	43.5	28.2	57.17	75.32
August	3.38	8	79	65	72.5	62	33	48.5	24.0	59.96	71.16
September	.22	5	82	73	76.6	63	46	53.7	22.9	66.03	65.46
October	12.74	6	86	71	80.4	70	50	61.8	18.6	72.77	67.77
November	4.07	7	88	79	83.7	74	52	66.5	17.2	77.50	63.21
December	2.64	6	93	81	86.7	78	62	69.5	17.2	80.45	65.58
1954											
January	5.66	16	88	78	83.6	75	62	68.7	14.9	77.54	75.67
February	10.57	18	89	79	84.8	79	68	72.4	12.4	80.00	80.88
March	1.27	6	89	78	85.7	72	63	67.7	18.0	77.93	76.40
April	1.45	11	85	77	80.7	67	57	62.4	18.3	72.19	75.60
May	3.16	6	84	66	75.9	62	42	55.1	20.8	65.58	70.90
June	.59	7	76	61	70.2	60	38	51.1	19.1	58.83	74.93
Totals	45.81	98									

Grub Damage Slight

Relatively small emergences of the cane beetles *L. trichosterna* Lae and *P. furfuracea* Burm. were reported during October, 1953. Grub damage from the previous generation, although varying from slight to severe, was localised in small areas, and the worst occurred in old ratoons. It was considered that only nine acres justified the expense involved in control

measures and this area was fumigated with carbon bisulphide. The spotty nature of grub infestation in South Queensland and the unpredictability of the areas likely to be affected have, to date, ruled out BHC applications on plant cane as a protective measure.

New Fungal Affection More Widespread

The species of *Verticillium* which was reported as having affected ratoon stubble in

1952, and which caused ratoon failures to a limited extent in that year, was more widespread in 1953. During the winter and early spring months appreciable areas were affected. The problem was not restricted to one soil type, nor has it been tracked down to any single factor in crop treatment. Experiments, including molasses applications, have been inaugurated on affected areas in an attempt to control the spread of the disease.

Control of Ratoon Stunting Disease

During the year the various Cane Pest and Disease Control Boards in the southern districts carried forward the active campaign of plant treatment. Hot water treatment tanks, set up in all districts, operated continuously throughout the planting season. In addition to handling commercial cane varieties the total plant supplies of the new canes, N.Co.310 and Vesta, were treated; the district will thus start off with disease-free stocks of these new releases.

EXPERIMENT STATION OPERATIONS

New Varieties Introduced

During the year a number of cane varieties, released from the quarantine house, were planted on the Experiment Station. These included 36 of the collection made in New Guinea in 1951, C.P.48/103 from Canal Point, Cl.41/142 from Florida, and F.31-436, F.31-962, and F.36-819 from Formosa. In addition E.129, Q.56, Q.58, and 45 M.Q.3205 were introduced from other Queensland districts. These, after initial propagation, will enter the progressive trials for assessment in comparison with seedling and commercial varieties.

The previous year's introductions from quarantine had multiplied sufficiently for planting in their first comparative trials and accordingly B.4098, B.41211, B.41227, C.P.43/47, C.P.44/155, H.39-5803, P.R.902, and P.R.905 were included with plantings of selected seedlings.

Annual Seedling Selection

As a result of the annual seedling selection procedure 78 of the "N" series were planted in the first selection trial; an additional 53 selections were forwarded to the Beerwah isolation plot for ultimate planting and trial in the Moreton district.

Later Trials

The yield trial of the "L" series seedlings planted in 1952 was harvested during the spring

of 1953. It included, in addition to the 58 "L" seedlings, Co.475, F.108, P.O.J.2967, P.O.J.3016, K.128, and Q.47. At harvest Co.475 and F.108 were superior to the Q.47 as were also a considerable number of the "L" seedlings, but selections for replicated trials will not be made until the ratoon crop is ready for harvest.

In the first ratoons of the "K" series yield trial — which included in addition P.O.J.2961, 40 S.N.5819, 41 S.N.3261, 41 S.N.3339, and Q.47 — selections were made for a later replicated planting. These were K.26, K.162, 40 S.N. 5819, 41 S.N.3261, and 41 S.N. 3339. All were hot water treated before replanting.

A second ratoon yield trial with the "J" series seedlings plus 33 S.N.1882, 39 S.N.3821, and Q.47 did not result in any selection being made.

From the 131 "M" series seedlings selected and planted in the previous year, 49 were re-selected and planted in a yield observational trial in 1953; included in the same planting were the imported varieties B.37161, C.P.36/111, C.P.36/183, C.P.43/64, C.P.44/101, C.P.49/50, H.37-1933, F.134, and two seedlings of the "L" series.

Reassessment of Some Old Varieties

In view of the implications of ratoon stunting disease and the fact that some older varieties

may have degenerated as a result of infection an attempt is being made to reassess their growth potential. Such old favourites as P.O.J.2878, M.1900 Seedling, and Q.813 have been planted after hot water treatment at 50°C. for two hours. The resulting stocks will be utilised for trial purposes against disease free C.P.29/116, Q.47, Q.49, and Q.50 to determine relative values as commercial canes.

The Long-range Trash Trial

In 1953 was harvested the first ratoon of the sixth rotation of this long-range trial, in which the practice of conserving trash in alternate interspaces is compared with the normal procedure of burning all trash and tops. On this

red basaltic loam, and under the semi-tropical environment, with an annual rainfall averaging 42.85 inches, there does not appear to be any advantage accruing from the more costly method. Details of the various crops, together with totals, are shown in tabular form below.

A new treatment has now been introduced into this trial. The trash and no-trash areas remain as before, but, superimposed on the original layout is a potash treatment plan. This is designed to assess the effect of varying amounts of potash both on the trash and no-trash plots. It is based on trash experiments in other countries where results, in many cases, appear to be more marked where soil potassium deficiency exists.

Year of Harvest	Variety and Class	Trash Plots		No Trash Plots	
		Cane per acre tons	Sugar per acre tons	Cane per acre tons	Sugar per acre tons
1934	Q.813 Pl.	36.2	5.83	36.2	5.68
1935	Q 813 1st R.	9.4	1.24	13.1	1.69
1937	P.O.J.2725 Pl.	19.1	3.11	18.6	3.11
1938	„ 1st R.	39.5	5.53	34.7	5.03
1939	„ 2nd R.	30.9	4.85	29.0	4.41
1941	P.O.J.2878 Pl.	44.0	6.42	43.9	6.25
1943	„ s/o 1st R.	42.9	6.48	43.6	6.67
1946	„ s/o A.P.	15.7	1.95	17.1	2.09
1948	Q.49 Pl.	42.1	6.38	44.9	6.88
1949	Q 49 1st R.	30.7	4.15	29.7	4.08
1950	Q.49 2nd R.	37.4	4.54	37.1	4.47
1952	Q.49 Pl.	22.8	2.78	22.9	2.76
1953	Q.49 1st R.	43.4	5.93	38.7	4.95
Totals		414.1	59.19	409.5	58.07



Fig. 28.

Harvesting the permanent trash trial on Bundaberg Station. This experiment was started in 1933.

Is B.H.C. Toxic to Sugar Cane ?

The tendency for growers, in areas subject to grub attack, to apply BHC more frequently or more heavily than recommended inspired a trial to discover whether overdoses would affect cane growth. Grubs do not occur on the Experiment Station, so any reduction in yield could be attributed to toxic effects from the insecticide. The opportunity was taken in 1952 to include both refined (60-70 per cent. gamma isomer) and crude (13 per cent. gamma isomer) BHC. In addition the methods of placement will show whether the BHC interferes with fertilizer uptake, since in some treatments the BHC and fertilizer have been mixed together. In the first cane crops harvested no significant differences were apparent.



Fig. 29.

The remodelled and extended office-laboratory building at Bundaberg.

Single Versus Split Dressings of Sulphate of Ammonia

The effect of splitting the nitrogen dressing was measured on two varieties, Q.50 and C.P.29/116. Prior to planting the trial a crop of Sudan grass was grown, cut, and carted away with a view to depleting the soil nitrogen content; on this red basaltic soil nitrates build up rapidly during fallow periods. The dressing of 300 lb. sulphate of ammonia per acre was then arranged as follows:—

1. 300 lb. in December.
2. 150 lb. in November + 150 lb. in December.
3. 100 lb. in November + 100 lb. in December + 100 lb. in January.
4. 75 lb. in November + 75 lb. in December + 75 in January + 75 lb. in February.
5. No sulphate of ammonia.

When harvested the results showed—

- (a) There were no significant differences between nitrogen treatments in regard to

the variety Q.50—either in terms of cane or sugar per acre.

- (b) With C.P.29/116 treatments 2, 3, and 4 significantly exceeded the untreated control in cane per acre at the 1 per cent. level.
- (c) With C.P.29/116 treatment 2 exceeded the control in tons of sugar per acre at one per cent. level and treatment 1 at the five per cent. level.
- (d) Juice analysis carried out in June, July, August, and September showed that Q.50 exceeded C.P.29/116 at the one per cent. level on all occasions.

There are suggestions here that the split dressing may be superior to the one application with C.P.29/116, but it will be necessary to examine ratoon crop results to observe the trend. The fact that Q.50 did not show any significant benefit from nitrogen may indicate a better nitrogen economy than that possessed

by C.P.29/116; it could, on the other hand, be the result of the higher yield produced by C.P.29/116 and the extra call on soil nitrogen supply.

New Weedicide Investigations

Weed control with the sodium salt of 2,4-D has been performed on this Station for some years. Although only minor break-downs have been experienced the newer compounds are being tested to assess any improved weedicide value. Trials have accordingly been instituted including the butyl ethanol ester and the diethanolamine and limethylamine salts of 2,4-D.

Building Alterations and Additions

The office-laboratory building, constructed in 1925, became too small for the increasing staff, which now numbers eight. During the year the building was remodelled and three new offices added. At the same time one laboratory was converted to provide office space and the juice analysis work transferred to another building.

Annual Field Day

Some 550 cane growers, mill executives, and other persons associated with the sugar industry attended the field day in May, 1954. These

occasions are valued by the sugar community because of the opportunity afforded to inspect and discuss progress in varietal improvement and other investigations under way.

Laboratory Work

The following is a summary of cane and water samples handled during the year:—

Station and trial cane samples	..	..	1,229
Farmers' cane samples	..	..	704
Irrigation waters	..	..	17

Summary of Crops Grown on Station

Varieties harvested, 1953 season—

					Tons
Q.47	..	..	..	..	6.75
Q.49	..	..	..	..	137.8
Q.50	..	..	..	..	114.8125
C.P.29/116	..	..	..	..	103.2375
P.O.J.2878	..	..	..	..	96.325
Seedlings	..	..	..	..	420.5625
				Total	879.4875
Plant cane harvested	..	..	..		369.325
Ratoon cane harvested	..	..	..		510.1625
				Total	879.4875
Total cane harvested for mill	..	..	..		860.35
Used for samples and plants	..	..	..		19.1375
				Total	879.4875
Total acreage harvested	..	..	..		25.77
Average tonnage per acre	..	..	..		34.12

Division of Cane Breeding

(J. H. Buzacott, Senior Plant Breeder)

Introduction

The functioning of the increased staff of the plant breeding division, as reported last year, has resulted in the performance of more effective work. It has been possible to carry out a considerable amount of research work, and steps have been taken to improve the equipment available and so allow of an increased amount of investigational work in the near future. Plans for the conversion of a residence to a laboratory have been prepared and tenders for the work called. This laboratory has been designed to house the plant breeding and entomological staff, and provision has been made for badly needed requirements such as an adequate fuzze packing room and an improved laboratory for cytological work. The provision of this new laboratory was necessitated by the increase in the staff at Meringa during recent years. In order to further cytological investigations a modern, high quality^o microscope has been ordered and its delivery is expected at an early date. A glass partition was erected in the glasshouse dividing it into two sections. One of these sections is to be fitted with thermostatically-controlled electric heating in order to carry out studies in pollen production. In the coming year provision has been made for the construction of a dark room in which experiments can be carried out on photo-periodic effects and their relationship to the flowering of sugar cane.

Cross Pollination

Arrowing in 1954 was early and profuse and quite a number of varieties, which do not flower in normal seasons, produced arrows; the Burma clone of *S. spontaneum* was one of these. This is only the second time this variety has flowered in the past ten years. As on the previous occasion its flowers appeared almost without warning and lasted for only a brief period.

E.P.C.38-304, a Colombian variety of the parentage P.O.J.2725 x *S. spontaneum* Burma, flowered early in the season before it could be used in crossing. However, it produced one late arrow which was crossed with Badila and if the cross takes it is hoped to have some seedlings of one-quarter Burma strain next year with which further nobilisations may be carried out. One breeding cane was selected from the five available original seedlings of the cross Badila x 51 N.G.63; this represents a first nobilisation of a vigorous New Guinea *robustum*. The selected seedling is named Q.B.53-1 and as it showed good pollen tests it was crossed with Q.13 and Korpi. Co.475, a very vigorous Indian variety with good sugar content, produced a few arrows and was used in reciprocal crosses with select parent canes. Of the 1951 New Guinea collection the *robustum* varieties 51 N.G. Nos. 63, 91, 91A and 140 were used in crosses, whilst of the nobles 51 N.G. Nos. 5, 36, 40, 45, 50, 61, 64, 111, 133, 146 and 163 flowered and were all used. Two other nobles, 51 N.G.53 and 51 N.G.95, produced a few arrows but were not used in crossing. Self-pollinations were carried out with a number of varieties and included two second generation selfs of J.B.13, one second generation self of E.281, and selfs of Korpi, Comus, G.362, Eros, Q.27 and E.281.

The profuse arrowing enabled more crosses suitable to the Burdekin District to be made than was possible last year. This was ensured by the ready availability of the arrows of such varieties as Q.13, Q.27 and Badila which produce the thicker shorter types of seedlings which are more desirable for the rich lands of the Burdekin basin.

Both bi-parental and polycrosses were made, the latter being used to test the value as females of a large number of varieties new to crossing. The first crosses were set up on 12th May and by the end of May no less than 184 were in



Fig. 30.

An area cross in the Meringa light-forest.



Fig. 31.

A poly-cross in operation at Meringa. This mass pollination procedure has only recently been used in Queensland.



Fig. 32.

Crossing lanterns showing method formerly used with portion of foliage left on arrows.



Fig. 33.

The present lantern crossing method; all foliage is stripped from the arrows.

progress, in addition to a polycross using 180 arrows. The crossing season was very heavy and of short duration so that very few crosses were set up after 17th June — only ten being commenced after that date. The total number of crosses achieved during the season was 334 whilst the polycrosses resulted in the collection of seed from a further 49 varieties. Details are given in Table I, whilst the female parents used in the polycross are shown in Table IA.

The method of maintaining arrows in solution consisted of an almost complete defoliation of the arrows, and their maintenance in a solution of 150 p.p.m. sulphur-dioxide and 85 p.p.m. phosphoric acid; this was used exclusively in the 1954 crossings. No difficulties were experienced and the saving in labour enabled many more crosses to be carried out. A check of germination of seed produced by the new method compared with the old showed that germination was neither better nor worse.

Arrowing Delayed Chemically

Two methods of delaying arrowing have been used as standard practice at Meringa in recent years. These are the lopping of varieties in February and March and the use of a lighting system to break the hours of darkness to which the growing cane is exposed. In view of the use of maleic hydrazide in U.S.A. to reduce the rate of growth of grasses, it was thought that, with careful attention to solution strength and spray timing, it might be possible to delay arrowing without completely preventing it. A comprehensive experiment using 0.25, 0.5 and 1 per cent maleic hydrazide was carried out on two early arrowing varieties, C.P.29/116 and P.O.J.2725, the first application being made on 19th February and the last on 9th April. The heavier application caused severe yellowing and some stunting of the plants, but the cane recovered rapidly. The final result showed that 1 per cent maleic hydrazide solution applied ten to twelve weeks before the normal flowering time was the most useful for the purpose of delaying arrowing and resulted in a delay of several weeks. Crosses were effected with P.O.J.2725 arrows delayed by maleic hydrazide and the germination of fuzz from them will be

compared with that from crosses with arrows of the same variety delayed by lighting. Crosses with C.P.29/116 arrows delayed by the chemical means were also made. The pollen viability of C.P.29/116 shown by the iodine test was not reduced by the use of the chemical. If the germination is not affected by the maleic hydrazide treatment a third useful method of delaying arrowing will be available. Of the three, the chemical means would be the most valuable as it is less laborious than lopping and far more widely applicable than lighting.

Effect of Maleic Hydrazide on Grass Growth

Another trial with maleic hydrazide was carried out on two lawn grasses, blue couch (*Cynodon dactylon*) and Mackey's couch (*Chrysopogon acicularis*). Spraying was done during the wet season when the grasses were in a state of rapid growth. Treatments ranged from 0.2 per cent. to 1.6 per cent. solution applied at the rate of 100 gallons per acre. The heavier applications delayed the growth of blue couch but scarcely to a stage where the chemical could be used as a substitute for mowing. On Mackey's couch, however, it produced spectacular results. This grass seeds prolifically and all treatments except the lowest inhibited seeding for several weeks whilst the higher treatments maintained the lawn in a condition which did not require mowing for at least two months.

Temperature and Pollen Fertility

It was intended to carry out further studies in the fertility of pollen during the 1954 crossing season. A partition was erected in the glasshouse for this purpose, but it was impossible to have the necessary thermostatically-controlled electric heating apparatus installed in time to take advantage of the arrowing period.

Tests to Improve Seed Germination

Tests in methods to improve germination of seed showed that shading of flats produced a slightly more rapid germination but that final germination was not improved. If shades are used care must be taken to avoid scorching of



Fig. 34.

Female arrows in the drying rack after cross pollination.

the young seedlings after the shades are finally removed. During recent years Aretan solution has been substituted for Uspulun, the mercurial fungicide which was used for spraying flats for many years to prevent fungus attack on the young seedlings. A check using Aretan at the normal strength used (0.1 per cent.) against solutions of half strength and four times strength respectively showed that even the strongest of these solutions had no deleterious effect on germination.

Varietal Morphology

Morphological studies were carried out by the geneticist with particular reference to stem and leaf epidermis and also pubescence. Examinations of stem and leaf epidermis were made principally as an aid to the identification of certain of the New Guinea varieties and for the separation of various Badila clones. These studies revealed that four typical clones of

S. robustum, 51 N.G. Nos. 70, 71, 91 and 91A have the same basic stem epidermal pattern. Several groups of the New Guinea noble canes of the 1951 collection were also examined and evidence was forthcoming that some varieties which were thought to be identical, carried different stem epidermal patterns. In the variety, 51 N.G.89, which has a hairy stem, the hairs appear to replace the silica cells in the stem epidermis. It was interesting to find that the three New Guinea *spontanеums* represented at Meringa all have sunken stomatal grooves fringed with rows of spines, a character often found in *S. spontanеum*.

The pubescence of cane leaves and stalks was given considerable attention with a view to selecting hair groups which might be of value in inheritance studies. Those groups which were found to be most constant were used to assist in the identification of a number of the varieties of the New Guinea collection.

Cytological Investigations

The chromosome investigations which were commenced in 1953 were continued but it was obvious that the microscope equipment was inadequate for the work. Accordingly steps were taken to procure a high quality research microscope and its delivery is expected in the near future. In the meantime the work was directed towards gaining further experience in the technique of counting chromosomes. The most satisfactory results were obtained by using the Feulgen reaction and on arrival of the new equipment the chromosome counts will be carried out using this method.

Segregation of Badila Types

In 1952 a collection of variants of Badila was made from all North Queensland districts where Badila is grown. The varieties were propagated on a large scale in 1953 and observations made which enabled a number of them to be identified as different clones. In addition two more types were located at Tully and planted at Meringa in 1953, whilst still one more was added to the series in 1954. The 1952 collection can now be stated to contain the following varieties: Badila, Black Badila, Oba Badila, Thick Badila and Badila Seedling. Of these, Badila, Thick Badila and Badila Seedling are distinct

types and readily distinguished from one another when growing side by side. It is difficult to distinguish Black Badila from Badila, whilst Oba Badila and Badila Seedling could be identical although the former appears slightly more vigorous whilst the latter seems to lodge more easily; both arrow more freely than ordinary Badila. Of the two varieties introduced to the station in 1953, one is heavily waxed and quite a distinctive type. A large block of this variant was seen at Innisfail recently and from its general appearance it has been called Grey Badila. The other Tully type may also be distinct, but it will be necessary to see a larger stand of it before a decision can be made. Most of the Badila variants appear to be sports of Badila. A critical study of the stem epidermis shows that these have an identical pattern. However, Grey Badila appears to possess a different epidermal pattern and, although examinations of more material must be carried out before a definite decision is made, this is considered to provide some evidence that Grey Badila is not a Badila sport but a distinct variety. C.c.s. tests on the five Badila types in the larger propagation plots showed that under the conditions of the trial, the two varieties from the Burdekin district, namely Black Badila and Oba Badila, had slightly higher sugar than the other varieties.



Fig. 35.

Method of arrow transport from field to crossing area.

VARIETAL STATISTICS

A marked increase in tonnage of cane was produced throughout the State in 1953. An analysis of the production in the various cane-growing areas shows that this increase oc-

curred in all districts, but particularly in the southern and central districts. Table II shows the tonnages of all varieties harvested in the main cane-growing districts for the 1953 crop. Comparison with the figures for 1952 reveals that the total 1953 crop was a 27.8 per cent. increase on that of the previous year. The crop North of Townsville was only up 7.8 per cent., whilst in both the Mackay and Bundaberg districts the increase exceeded 50 per cent. An increase in the area under cane was partly responsible for the larger crop, but a good growing season in the southern and central districts accounted for a considerable portion of the increase.

Q.50 Becomes State's Premier Variety

For the first time Q.50 gained the place of premier variety in the State and in doing so displaced Trojan which had held that honour for three successive years. The win was particularly meritorious as it represented 27 per cent of the whole State crop, this being seven



Fig. 36.
Bags of cane fuzz drying in the glasshouse.



Fig. 37.
Fuzz planting in glasshouse.



Fig. 38.

Irrigating seedlings immediately after transplanting to the field.

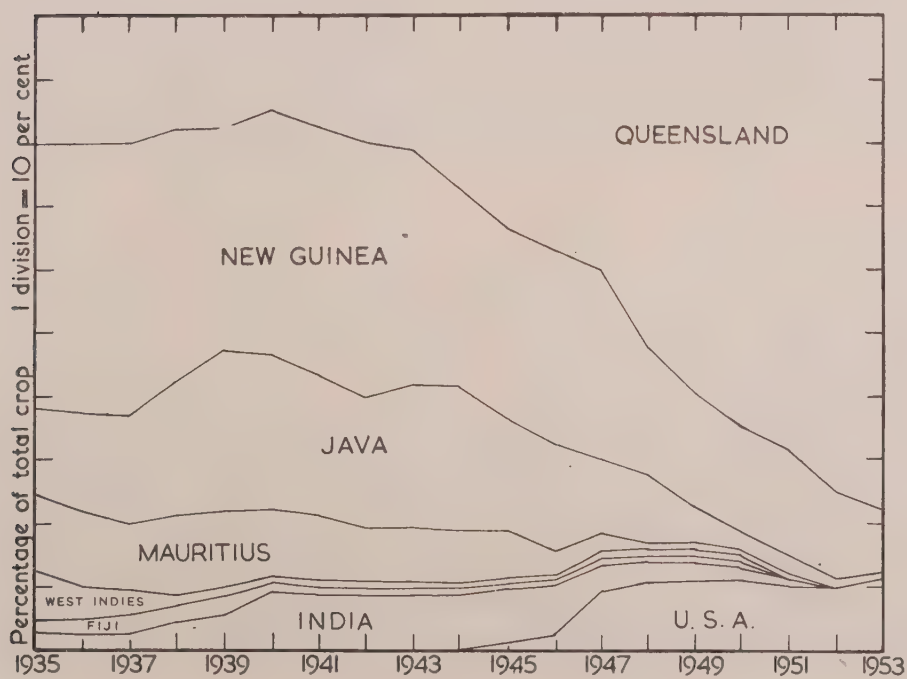


Fig. 39.

The composition of the Queensland crop on the basis of country of origin from 1935 to 1953.

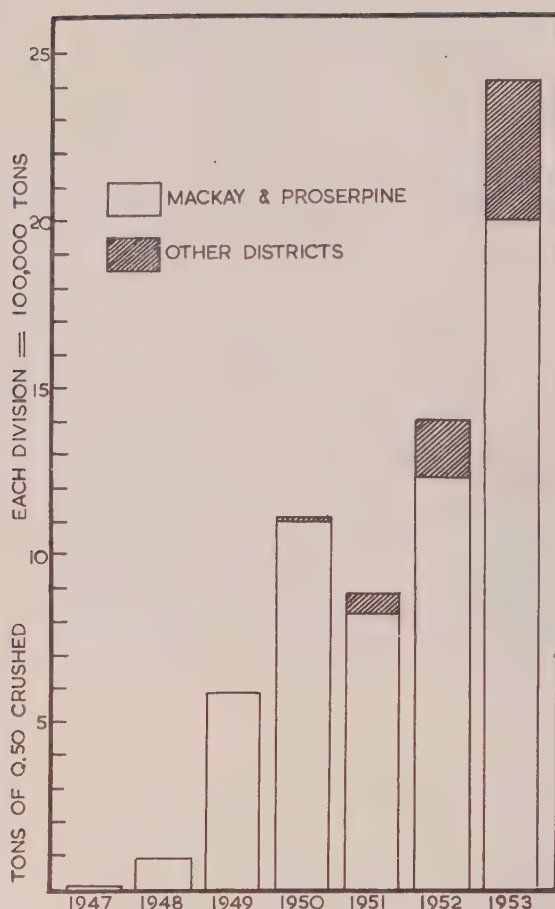


Fig. 40.

Showing the increase in tonnage of Q.50 crushed in Queensland.

per cent. better than its previous year's figures, whilst Trojan dropped back to 18 per cent, some five per cent. less than the previous year. In producing 2,405,069 tons, Q.50 was the first variety in Queensland ever to exceed 2,000,000 tons and was 800,000 tons ahead of its nearest rival. The increase in Q.50 occurred in all parts of the State with the exception of the Burdekin district. Naturally the greatest part of its crop was produced in the central districts of Proserpine and Mackay where, in producing only 20,000 tons short of the 2,000,000 tons mark, it achieved 80 per cent. of the crop. Reaching 16.7 per cent of the Bundaberg district crop it has also become a major variety there, and it is to some extent replacing C.P.29/116.

The rapid rise of Q.50 to its present position is shown in Figure 40.

Trojan fell in popularity north of Townsville, dropping from 30 per cent to 24 per cent of the crop. A slight increase occurred in the Burdekin where it represented the high figure of 59 per cent of the total crushing. It seems likely that in 1954 the popularity of Pindar in the Burdekin district will affect Trojan's figures. Elsewhere in Queensland Trojan is not important, representing less than two per cent of the Mackay crop and less than one per cent at Bundaberg.

Pindar, although still remaining in third position, which it attained in 1952, made a further improvement in tonnage and increased from 15 to 17 per cent of the total crop. It is now less than one per cent behind Trojan and seems certain to displace that variety for second position in 1954. Its crop exceeded one and a half million tons; thus three varieties produced in excess of that figure for the first time in the history of the State.

Also for the first time in the State's history four varieties produced more than 1,000,000 tons each. The fourth of these was C.P.29/116 which, owing to the excellent Bundaberg crop, represented 11.7 per cent of the total State crop — a two per cent. increase on its figure for the previous year. It remains to be seen whether the propagation of this variety in the Mackay district, which is now proceeding, will improve its figures in future years or whether the popularity of Q.50 in Bundaberg, largely at its expense, will counter-balance any extension of the area it occupies in Mackay.

Badila Decreasing in Popularity

Badila, still on the downward path, was displaced one more stage from fourth to fifth position. Its tonnage decreased in all districts where it is grown except in Proserpine and Mackay, where it produced practically the same tonnage as in the previous year. It is not, however, important in those districts. Although many farmers from time to time attempt to bring Badila back again they soon return to the higher yielding hybrids. Representing in 1953 only nine per cent. of the total State

crop and six per cent. of the Burdekin crop, it is important now only north of Townsville where it is still responsible for 23 per cent. of the crop and ranks third in varietal importance.

After Badila no other variety reached three per cent. of the total crop. Comus retained

sixth position and is grown mainly in the Burdekin district and north of Townsville. Q.28 and Q.47 have both displaced Q.44 from seventh place. This is probably largely a reflection of the good crops in the central and southern districts since Q.28 dropped 1.4 per



Fig. 41.

A well stooled clone among 51 N.G. 91A selfs.



Fig. 42.

Broad-leaved clone among 51 N.G. 91A selfs.



Fig. 43.

Two of the 1951 New Guinea robustums flowering.



Fig. 44.

Selfs of S. robustum 51 N.G. 91A showing extreme variation in vigour.

cent. in Mackay, whilst Q.47 dropped back almost 1 per cent. in Bundaberg and Q.44 fell by the same figure in the far north. Eros has shown a slight improvement in position, whilst S.J.16 and Q.49 have dropped back slightly. Of newcomers to the approved list Vidar and Q.55 have both moved up the scale to represent 0.3 per cent. of the crop, whilst Ragnar is 0.1 per cent. The necessity for treatment of stocks of new varieties for ratoon stunting disease has delayed the appearance of several new varieties on the list of varieties crushed.

Queensland Bred Canes now Three-quarters of Crop

Once again there was an improvement in the percentage of Queensland bred varieties grown which increased from 75.4 per cent. of the total in 1952 to 77.4 per cent. in 1953. Table VII shows the tonnages of varieties which originated in Queensland and other countries and the percentage of the total crop contributed by each country. These figures are also illustrated graphically in Figure 39. The percentage of New Guinea varieties, represented only by Badila, fell from 12.6 to 9, whilst that of United States varieties, represented only by C.P.29/116, rose from 9.9 to 11.6. Javanese varieties in E.K.28 and P.O.J.2878 still retained their status at the low figure of 1.5 per cent., whilst Indian, Mauritius and Fijian varieties also maintained their former figures of 0.3, 0.1 and 0.1 per cent. of the crop respectively.

With the wide propagation of Q.56, Q.57, Q.58, Q.59, Castor, Luna and Vidar, which has been delayed in order that only stocks free from ratoon stunting disease will be released, there will be a steady increase in the percentage of Queensland bred varieties. The decline

of Badila is very marked and it appears to be only a matter of time before an earlier maturing cane, which does not arrow freely but yet has the same valuable characteristics of C.P. 29/116, is bred to replace this latter variety. Co.475, a recent introduction from India which, on account of its high yielding capacity in trials may have assumed commercial importance in Queensland, has succumbed to red rot and it is doubtful whether N.Co.310, a South African cane which should become popular as a minor variety on account of its early high sugar, will ever contribute any significant amount to the State crop.

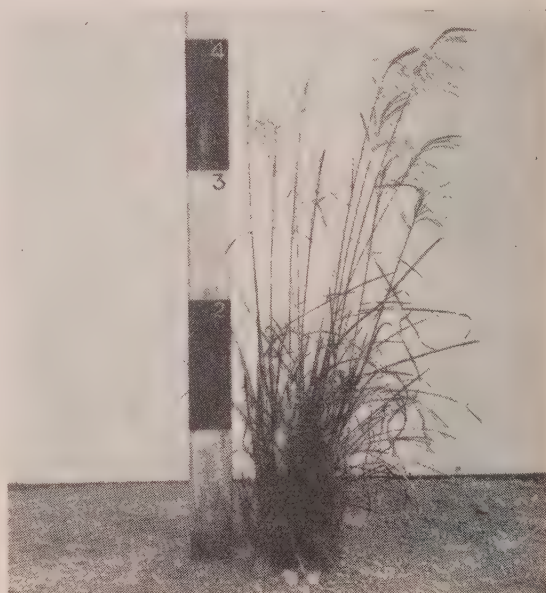


Fig. 45.

Miscanthus floridulus from the New Guinea high-lands flowering when very small at Meringa.

Table VII.
Countries of Origin: 1952 Crop.

Country of Origin								Tons of Cane	%
Queensland	..	..	..	..	..	..	..	6,778,846	77.4
U.S.A.	..	..	..	..	..	..	..	1,015,489	11.6
New Guinea	..	..	..	..	..	..	..	784,954	9.0
Java	..	..	..	..	..	..	..	127,729	1.5
India	..	..	..	..	..	..	..	24,086	0.3
Mauritius	..	..	..	..	..	..	..	7,673	0.1
Fiji	..	..	..	..	..	..	..	6,704	0.1
S. Africa	..	..	..	..	..	..	..	3,767	—
West Indies	..	..	..	..	..	..	..	1,815	—
								8,751,063	100.0

TABLE VIII

LIST OF BI-PARENTAL CROSSES MADE DURING 1953 SEASON

A.130	.. .. .	x Comus, Eros.
Badila	.. .. .	x Comus, Co.475, E.P.C.38-304, G.269, G.362, Hind's Special, 51 N.G.63, Q.27, Q.28.
B.4098	.. .. .	x G.362
Castor	.. .. .	x G.362
Co.213	.. .. .	x Badila, Comus, Eros, G.362, P.O.J.2878, Q.36, 32-3575.
Co.270	.. .. .	x Eros, G.362, M.336, J.B.3, P.O.J.2878, P.O.J.2940, Q.31, Q.36, 39 S.N.3821.
Co.281	.. .. .	x Korpi
Co.290	.. .. .	x M.336.
Co.475	.. .. .	x Badila, G.362, Korpi, P.O.J.2878, Q.27, Trojan.
C.P.29/320	.. .. .	x Eros.
C.P.36/105	.. .. .	x Eros.
C.P.48/103	.. .. .	x Eros.
D.209	.. .. .	x Comus, Co.290, E.281, G.362, P.O.J.2878, Q.31, Q.58.
D.285	.. .. .	x Co.290, Eros, G.362, I.202, 51 N.G.63, 51 N.G.91, 51 N.G.91A, P.O.J.2940, Q.28, Q.31, Q.36.
E.281	.. .. .	x 51 N.G.140.
E.P.C.38-304	.. .. .	x Badila.
Eros	.. .. .	x A.130, Co.290, Co.301, C.P.36/105, C.P. 48/103, G.331, Korpi, M.336, P.O.J.2878, Q.28, Q.53.
Fiji 30	.. .. .	x G.362.
Fiji 31	.. .. .	x G.362.
F.31-962	.. .. .	x G.362.
F.36-819	.. .. .	x G.362.
G.217	.. .. .	x G.362, Pompey, Q.36.
G.252	.. .. .	x Q.13.
G.263	.. .. .	x Comus, M.336, Q.31.
G.323	.. .. .	x Trojan.
G.331	.. .. .	x Eros.
G.362	.. .. .	x Badila, Co.475, M.336, P.O.J.2878.
H.231	.. .. .	x G.331.
H.364	.. .. .	x Q.28.
I.235	.. .. .	x Co.290, G.323, G.362, P.O.J.2940.
I.426	.. .. .	x Q.28.
J.337	.. .. .	x Badila, Comus, Co.301, E.281, Eros, G.270, G.362, Pompey, Q.27, Q.28, Q.31, Q.33, Q.36, Q.39.
Korpi	.. .. .	x Co.281, Co.290, Co.331, Co.475, Eros, Hind's Special, K.5, 51 N.G.63, 51 N.G.140, Q.B.53-1, P.O.J.2878, Q.27, Q.28, Q.36, Uba Marot.
Luna	.. .. .	x Badila.
M.63-39	.. .. .	x Eros, P.O.J.2878.
M.112-34	.. .. .	x Badila, C.P.43/47, Q.28.
M.134-32	.. .. .	x Q.28.
M.165-38	.. .. .	x Badila, C.P.43/47, Q.28.
M.336	.. .. .	x Co.290, Eros, G.362.
39 M.Q.832	.. .. .	x E.281.
45 M.Q.2569	.. .. .	x Badila, G.362.
N.Co.310	.. .. .	x C.P.29/116 Eros, P.O.J.2878, P.O.J. 2940, Q.36, 32-3575.
51 N.G.5	.. .. .	x G.362, Q.27.
51 N.G.36	.. .. .	x Q.27, Q.28.
51 N.G.40	.. .. .	x Q.27, Q.28.
51 N.G.45	.. .. .	x Q.28.
51 N.G.50	.. .. .	x Q.28.
51 N.G.61	.. .. .	x Q.27.
51 N.G.64	.. .. .	x Q.27.
51 N.G.111	.. .. .	x Q.27.
51 N.G.133	.. .. .	x Q.27, Q.28.
51 N.G.140	.. .. .	x E.281.
51 N.G.146	.. .. .	x I.202.
51 N.G.163	.. .. .	x G.362, Q.28.
Pepe Cuca	.. .. .	x Badila, G.362.
P.O.J.2725	.. .. .	x Co.281, Co.290, Co.331, Co.617, Eros, Q.36, Trojan, 32-3575.
P.O.J.2875	.. .. .	x Co.281, Comus, Eros, Q.31.
P.O.J.2878	.. .. .	x Badila, Co.270, Co.281, Co.290, Co.301, Co.331, Co.475, Co.617, C.P.29/116, C.P.34/120, C.P.36/105, C.P.44/155, C.P.48/103, Eros, G.362, Hind's Special, Korpi, M.63-39, 51 N.G.63, 51 N.G.91, 51 N.G.91A, Orambo, P.O.J.2940, Q.27, Q.58, 32-3575.
Pompey	.. .. .	x Q.39.
Q.13	.. .. .	x Badila, Co.281, Co.290, Co.331, Co.475, Comus, C.P.36/105, C.P.43/47, Eros, G.252, G.269, G.270, G.323, G.362, Hind's Special, I.202, K.5, M.336, 51 N.G.63, 51 N.G.91, 51 N.G.140, Q.B.53-1, P.O.J.2878, Pompey, P.R.905, Q.27, Q.28, Q.36, Q.39, 32-3575.
Q.27	.. .. .	x Badila, Co.290, Co.475, Comus, P.O.J.2878, Q.31, Q.32.
Q.28	.. .. .	x Badila, Eros.
Q.33	.. .. .	x 51 N.G.63, 51 N.G.140.
Q.44	.. .. .	x Badila, Comus, C.P.43/47, G.362.
Q.50	.. .. .	x Badila, Comus, C.P.29/116, E.281, Eros, G.270, G.331, G.362, M.336, P.O.J.2878, Q.27, Q.28, Q.36.
Q.59	.. .. .	x Badila, Comus, G.331, G.362, P.O.J.2878, Q.27, Q.28.
Trojan	.. .. .	x Co.290, Co.331, Co.475, Comus, C.P.43/47, Eros, G.270, G.323, G.362, M.336, 37 N.G.6, Orambo, P.O.J.2878, P.O.J.2940, Q.47, Q.28, Q.36, Q.39.
Uba Marot	.. .. .	x Q.33.
Vidar	.. .. .	x Badila, Co.290, C.P.43/47, Eros, Hind's Special, Q.28.
31-2484	.. .. .	x Co.301, C.P.29/116, Eros, P.O.J.2878.
32-8560	.. .. .	x Co.290.
34-3171	.. .. .	x G.362.
35-198	.. .. .	x Badila.
39-5803	.. .. .	x Badila, Comus.
SELS	.. .. .	Comus, E.281, Eros, G.362, Korpi, Q.27, Q.B.53-2, Q.B.53-3, Q.B.53-4, 51 N.G.91A.

TABLE VIIIA

FEMALE PARENTAGE OF SEED SAVED FROM POLYCROSS, 1953 SEASON.

A.130	G.252	M.336	Pompey
Akbar	G.362	M.112-34	Q.13
Co.270	G.270	M.134-32	Q.28
Co.281	G.323	M.165-38	Q.31
Co.290	G.362	Mahona	Q.36
Co.475	I.216	39 M.Q.832	Q.44
Comus	I.235	N.602	Q.50
D.209	J.334	Neptune	Q.52
D.285	J.337	Oramboo	36 S.N.4995
Eros	K.5	P.O.J.2875	Trojan
F.108	K.602	P.O.J.2878	
G.217	Korpi	P.O.J.2940	

Table IX.

Varietal Composition and Distribution in the Four Main Districts and in the State as a Whole—1953 Crop

Variety	North of Townsville		Burdekin and Giru		Proserpine and Mackay		Bundaberg and South		Whole State	
	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%
1. Q.50	144,082	4.2	72		1,982,731	80.4	278,184	16.7	2,405,069	27.5
2. Trojan	824,208	24.3	724,982	59.0	45,992	1.9	8,919	.5	1,604,101	18.3
3. Pindar	1,208,483	35.6	193,443	15.8	86,885	3.5	46,265	2.8	1,535,076	17.5
4. C.P.29/116 ..					13,825	.6	1,000,029	60.2	1,013,854	11.7
5. Badila	698,919	20.6	77,912	6.3	6,895	.3			783,726	8.9
6. Comus	112,249	3.3	85,620	7.0	41,344	1.7			239,213	2.7
7. Q.28					157,164	6.4	6,604	.4	163,768	1.9
8. Q.47					26		144,381	8.7	144,407	1.7
9. Q.44	129,213	3.8							129,213	1.5
10. Eros	127,953	3.8							127,953	1.5
11. S.J.16			120,089	9.8					120,089	1.4
12. P.O.J.2878 ..	1,466	.1	1,609	.1	62,751	2.5	42,160	2.5	107,986	1.2
13. Q.49					7		42,283	2.5	42,290	.5
14. H.Q.426	27,947	.8	7,720	.6	4,118	.1			39,512	.4
15. Q.45					38,552	1.6			38,552	.4
16. S.J.4	27,622	.8	47						27,669	.3
17. Cato	27,271	.8							27,271	.3
18. Vidar	27,235	.8							27,235	.3
19. Q.55							24,617	1.5	24,617	.3
20. Vesta							22,692	1.4	22,692	.2
21. E.K.28			11,158	.9	8,042	.3			19,200	.2
22. Co.290					7,033	.3	9,779	.6	16,812	.2
23. Badila Sdg. ..	14,369	.4							14,369	.2
24. Ragnar	11,923	.4							11,923	.1
25. M.1900					7,089	.3	572		7,661	.1
26. Co.301							7,237	.5	7,237	.1
27. Q.51							6,875	.4	6,875	.1
28. Pompey	6,694	.2							6,694	.1
29. Q.42							6,319	.4	6,319	.1
30. S.J.2			2,690	.2	3,020	.1			5,710	
31. N.Co.310							3,761	.2	3,761	
32. B.208			1,812	.2					1,812	
33. Atlas							1,366	.1	1,366	.3
34. Q.56					1,093				1,093	
35. Q.25							1,046	.1	1,046	
36. Exp. and Others	4,497	.1	1,021	.1	674		8,427	.5	14,892	
	3,394,131	38.7	1,228,175	14.1	2,467,211	28.1	1,661,516	19.1	8,751,063	100.0

Division of Entomology and Pathology

(R. W. Mungomery, Officer in Charge)

GENERAL

The major activity of this Division during the course of the past year centred around a continuation of the all-out drive against ratoon stunting disease, though the volume of research work undertaken had necessarily to be restricted because of the long absence through illness of one of the Bureau's pathologists, Mr. D. R. L. Steindl. This curtailment particularly affected the investigations connected with the possibility of detecting the ratoon stunting virus by various physical methods—a study which Mr. Steindl pursued at Berkeley University, California, for portion of last year.

However, in applying the results from previous research, all Cane Pest and Disease Control Boards pushed ahead vigorously with their campaigns to combat this disease by providing stocks of healthy planting material. By and large their efforts proved quite successful and the net result has been that in at least one mill area sufficient clean stocks are now available to enable all future plantings to be made with healthy cane. Others are well on the way to attaining this goal. Unfortunately in a few instances the hot water treatment did not effect a cure of the disease, this doubtless being due to poor circulation failing to maintain a temperature of 50°C. uniformly throughout the treatment tank for the full two hours period, and it stems from a strict adherence to the customary practice of filling setts into bags for ease of handling. As a result bags have been largely superseded by wire baskets, it being obvious that the efficacy of the curative effect should not be jeopardised by poor circulation inherent in the system of treating setts in bags.

This and other aspects of the clean seed project to combat ratoon stunting disease were keenly discussed at the Conference of Cane Pest and Disease Control Boards held in Mackay on 29th April, 1954, at which a record number of 50 delegates attended. From the

information exchanged it was evident that the appearance of diseased volunteer stools in blocks of otherwise clean cane was a bugbear common to many districts, and suitable measures have been adopted to circumvent this happening in future.

The complete pattern of operations required to control this disease has not yet been entirely revealed but the small percentage of contaminations previously cited, leaves no ground for a complacent attitude on the part of those growers who, after having secured a small quantity of apparently clean planting material, have erroneously assumed that no further effort on their part would be required. Not only will it be necessary for further hot water treatment to be carried out for a number of years and additional propagations made from these sources, but it has also become increasingly evident that all Cane Pest and Disease Control Boards will have to assume full responsibility for these initial stocks instead of the partial interest maintained by some Boards hitherto.

The detection of chlorotic streak disease in the Mackay district at two separate centres, Plane Creek and the Pleystowe-North Eton area, was a disquieting discovery in view of the fact that this district had previously been regarded as being free from this particular disease. It is likely that its occurrence at Pleystowe originated as a result of an illicit introduction of cane from Ingham some years ago, but no obvious explanation was forthcoming for the outbreak at Plane Creek. Systematic surveys and strict control of planting material have been instituted in an endeavour to eliminate the sources of infection, but past experience with the disease in similar low-lying areas indicates that the task is not going to be an easy one.

The optimism expressed in last year's report regarding the anticipated further decline in the incidence of Fiji disease was fully justified, and for the first time since its discovery in the Bundaberg district, no Fiji diseased cane was found there during the 1953-54 growing period, despite repeated inspections of suspect fields. In the Moreton district infection was found on only one farm, and the two diseased blocks concerned are to be destroyed after harvest this year. This low incidence augurs well for its early extinction, and it is particularly timely in view of the possibility of over-production in 1955 influencing the standing-over of some crops, which, in turn, would seriously hamper any uncompleted eradication project.

A campaign similar to that carried out against Fiji disease, involving the use of healthy planting material and the roguing or destruction of diseased fields, has been operating successfully against "spindle stripe" disease in the Maryborough mill area, and a noticeable decrease in its incidence has been evident. An amendment to Proclamation No. 1 during the year included this and a number of other somewhat obscure maladies as diseases under "The Sugar Experiment Stations Acts, 1900-1954," and provided the necessary legal machinery to back up the measures taken for their control. At the same time this opportunity was utilised in making the schedule of insect pests more comprehensive so as to make provision against any future trouble from new pests.

Another legal measure taken during the year was the constitution of the Proserpine Cane Pest and Disease Control Board which was established with the full concurrence of the Proserpine District Canegrowers' Executive. The reason for its formation was primarily to take positive steps against ratoon stunting disease, but it is confidently expected that it will effect a general uplift in the efficiency of operations against other diseases and pests, which in turn will be reflected in increased production in that area. The establishment of this Board was the final act in bringing all canegrowing areas in Queensland under some organised system of pest and disease control.

Fortunately from the growers' angle insect pests were not troublesome except in a few instances of localised attack, but this general absence of any appreciable infestations imposed difficulties on experimentation and a larger



Fig. 46.

A conventional benzene hexachloride distributor applying BHC to young plant cane. This insecticide has attained a complete and unfailing control over the greyback grub.



Fig. 47.

A close-up of the BHC distributor showing the insecticide flowing from twin hoses on each side of the cane. The tynes cover it with soil and mix it in the root zone.

number of trials had to be established in the hope that at least a small proportion of them might subsequently become grub infested.

BHC continued to give general satisfaction against the greyback grub pest, but lack of populations in the field prevented a proper evaluation of some of the more promising of the newer insecticides. Attempts to seed small plots artificially with grubs for insecticide tests were similarly unsuccessful because of the scarcity of beetles. Under these circumstances, therefore, it is unlikely that there will be any appreciable displacement of BHC from the

Queensland sugar industry unless there are substantial price differences favouring these newer compounds.

Damage by animal pests was not of major importance, but some losses were incurred as a result of rat attack in a few northern mill areas and wallabies proved troublesome in restricted areas on some out-lying farms in the central district during the dry spring.

Further information in connection with the more important pests and diseases and the relevant investigational work is detailed separately hereunder:—

THE GREYBACK CANE BEETLE, *Dermolepida albohirtum* (Waterh)

Grubs of the greyback beetle were relatively unimportant as pests during the 1953-54 season. In the majority of northern districts not only was damage practically eliminated by the use of BHC, but beetle flights also were extremely sparse, consisting mainly of a few solitary individuals or at most small concentrations in the remoter sections of the canegrowing areas. Some flights occurred at Mossman in December, 1953, and others are known to have taken place at Woopen Creek and at Frenchman's Creek in the Babinda area, whilst the finding of odd grub-damaged stools at the ends of rows where BHC distribution had been unsatisfactory, demonstrated that beetles had been active in the Goldsborough Road section of the Little Mulgrave area.

In Mossman, Ayr, and Mackay greyback grub damage occurred sporadically to a greater extent than in the other mill areas, but even so the combined loss reported from these three districts was only as much as was frequently lost on a single farm before BHC came into general use. The occurrence of a number of patches showing slight loss in the central districts reflects the conservative attitude previously adopted there towards the use of BHC, where grub damage had mostly been sporadic in the past and not so consistently crippling to the farm economy as to demand the regular

application of protective measures. Examinations of untreated control plots in soil-insecticide trials in the Mulgrave and Innisfail districts, and to a lesser extent in the Tully area, disclosed that greyback populations were either completely absent or very low in the great majority of trial sites which were quite representative of the areas previously heavily infested. The total area damaged was 224 acres and the overall loss for the State was estimated at only 1,000 tons of cane. The quantity of

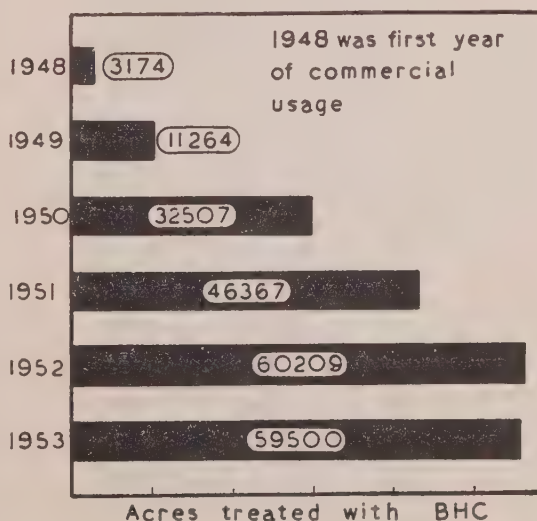


Fig. 48.

Showing the rapid development in usage of benzene hexachloride for cane-grub control.

BHC sold to protect the 1954 crop was equivalent to 1,707 tons of 20 per cent. BHC dust, which together with the small amount carried over from the previous season was sufficient to treat 60,000 acres. While this high proportion of vulnerable fields continues to be protected yearly, it is not anticipated that this pest will re-assert itself to any marked extent.

Insecticide Trials

Field trials were kept in progress during the year in order to secure data on several aspects of grub control by means of soil insecticides. The great majority of the trials failed to yield results because of the lack of grub infestations. It is becoming increasingly obvious that the continued absence of grubs will delay screening tests of new insecticides if field trials only are employed. Therefore, as an alternative, it is proposed to carry out plot tests in future using field-collected grubs or grubs bred from grey-back beetles captured on feeding trees.

BHC Re-treatment Trials

The comparison between a single application of BHC dust to the plant crop to provide three-year protection, and an equal quantity of dust divided into a plant crop application and a ratoon re-treatment was continued in a number of trials on the light red soils at South Johnstone. Of the 12 trials in progress two only—a first ratoon crop and a third ratoon crop—carried sufficient grubs to warrant being harvested this season. Last year, the plant crop yields from one of these trials, which had an average infestation of 0.7 grubs per stool, gave a non-significant difference of 0.24 tons per acre in favour of the heavier initial BHC treatment. The three successive crops that have now been harvested from another trial demonstrated that insofar as yields are concerned there was no significant difference between plots with single applications of BHC and those that were re-treated. Data from this trial are presented in the following table:—

Yields from three successive crops in BHC trial, South Johnstone.

Treatment rates per acre	Yield in tons per acre			
	Plant Crop	First Ratoon Crop	Second Ratoon Crop	Total for Three Crops
150 lb. 10 per cent. BHC dust to plant cane ..	38.73	40.74	35.73	115.20
75 lb. 20 per cent. BHC dust to plant cane ..	34.13	38.77	37.17	110.07
100 lb. 10 per cent. BHC dust to plant cane ..	33.49	39.14	38.72	111.35
+ 50 lb. 10 per cent. BHC dust to first ratoons ..				
75 lb. 10 per cent. BHC dust to plant cane ..	32.15	38.56	36.87	107.58
75 lb. 10 per cent. BHC dust to first ratoons ..	13.39	31.56	33.72	78.67
Control (Carbon bisulphide)				
Necessary difference for significance at 5 per cent. level	4.32	2.48	2.45	
Average grub infestation per stool	2.3	2.1	0.8	

An average infestation of only 0.8 grubs per stool in the second ratoons is not regarded as a sufficiently severe test to provide completely reliable comparisons, and the results of further trials will be awaited with interest.

Refined Versus Crude BHC

Of the eight replicates laid out to study this comparison only three were sufficiently grub

infested to warrant harvesting. Even so the average infestations in these, which varied between 1.25 and 2.25 grubs per stool, were not as high as would have been desired in comparing the refined 60 per cent. gamma BHC product with the crude BHC which contained 13 per cent. gamma isomer. Data in connection with the plant crop yields are given in the table following:—

Plant Crop Yields of BHC Plots, Refined Versus Crude.

Treatment rates per acre in terms of lb. of 1.3 % gamma BHC dust	Yield in tons per acre		
	60% gamma BHC	13% gamma BHC	Means
75	35.21	34.29	34.75
100	36.18	40.70	38.44
150	37.54	41.03	39.29
Means	36.31	38.67	37.49

s.e. Means 60% vs. 13% ± 1.337
 Amounts ± 1.638
 Individual ± 2.316

Mean for control = 32.70.

The treated plots yielded significantly more than the control plots at the 5 per cent. level, but the use of the two forms of BHC did not disclose any significant differences in the resultant yields.

Long-Range Soil Toxicity Investigations

Two plant crops were harvested from trials initiated as a result of a long-range investigation to ascertain whether continued applications of various amounts of BHC for grub control could alter the soil's cropping capacity, and whether any effect so produced could be modified by the use of the refined form of gamma BHC. The rates of application used ranged from the standard recommendations for one, two, and three-year control, to abnormally high yearly re-treatments simulating the excessive amounts that have sometimes been used by a few growers as a result of their misdirected enthusiasm to guarantee complete control. To accelerate the progress of the trial, BHC dust was ploughed in before planting in amounts equal to the estimated residuum from each respective treatment in a previous cropping cycle. In each series, a dust prepared from crude 13 per cent. gamma BHC was compared with the same strength dust prepared from the more highly refined 88 per cent. gamma BHC.

One trial on the Burdekin was harvested at the age of 16½ months and results were not influenced to any marked degree by extraneous factors. The control plots yielded 72.49 tons of cane per acre while the tonnage of the treated



Fig. 49.

A dense colony of aphids on a leaf of sugar cane.

plots varied from 71.33 to 74.05 tons per acre. Differences were not significant and these showed that it was not possible to detect any deleterious effect on soil fertility as a result of the amounts of BHC used up to the present. This is in agreement with the results obtained from a similar trial harvested at Bundaberg, which was referred to in last year's annual report.

The other trial was established in Babinda district but unfortunately an unexpected light grub infestation reduced the yield on the untreated soil. This prevented the yields of treated and untreated plots from reflecting any changed status in soil fertility. However, the average yields from the treated plots varied only slightly, i.e., between 38.25 and 39.07 tons per acre, and showed no significant differences in respect of the two grades of BHC used, which was in agreement with results obtained from other trials in which these comparisons have been set out.

FRENCH'S CANE BEETLE *Lepidiota frenchi* Blkb. AND ALLIED PESTS

In contrast to the lack of greyback beetle flights, frenchi beetles were quite numerous in some localities during the normal flight period. An emergence was recorded at Mossman in the second half of December, 1953, and a dense flight occurred in the Highleigh section of the Mulgrave district.

For the most part damage in these areas was negligible except at Mossman where a loss of 400 tons was debited jointly against this species and *L. consobrina*, since both grubs frequently occur in the same fields there. At Tully an area of about 10 acres was again damaged by frenchi grubs following the replanting of a block which had been damaged by the same species in the previous year. In the Mackay district there was a steep falling off in damage, and this season's losses from frenchi attack were insignificant.

In South Queensland damage by two-year cycle grubs at Burnett Heads and at Elliott Heads, although not extensive, was the worst in the Bundaberg district for many years. At Burnett Heads *L. trichosterna* was the species concerned, while at Elliott Heads both this species and *L. frenchi* were implicated. Altogether nine acres, comprising a number of

Miscellaneous Trials

Since there were indications that aldrin might become available at a price comparable with that of gamma BHC, some further screening of this newer insecticide seemed warranted. To that end six trials were established in the South Johnstone and Mossman areas in an attempt to determine the relative efficacies of these two insecticides against the greyback grub. However, in selecting the Mossman area for half of these trials the possibility of securing additional data from frenchi infestations was not overlooked, and dieldrin, although more costly, was also included in four trials because of its reputed longer residual effect. Despite the dispersal of these trials over a varied range of conditions grub infestations in them during the past year were such that it is unlikely that any results will be forthcoming from the plant crop, and the chief hope of securing data appears to lie in the ratoon crops.

patchy outbreaks, were fumigated in the Bundaberg area. In the Isis district flights of *P. furfuracea* were small, but as a result of the previous year's infestations damage to cane crops during early spring was severe on a few farms at Kowbi and South Isis, although damage generally was lightened by good summer rains. In the Moreton area two acres of old ratoons growing on high red loam in the Maroochy River section, were destroyed by a fairly large species of white grub which so far has not been identified. Diggings there revealed an infestation of up to ten grubs per stool, with an average of six.

A number of field trials with gamma BHC and aldrin applied at rates of 2 lb. and 4 lb. per acre both as drill dressings and as blanket dressings, were set out against *L. trichosterna* and *P. furfuracea* in the hope of intercepting infestations. However, even if these insecticides are found to be successful against these species their use is likely to have limited appeal because of the patchy and almost unpredictable occurrence of these grubs in southern canefield areas; hence efforts to control these pests must continue to be linked with carefully-timed ploughings and similar cultural operations.

MISCELLANEOUS INSECT PESTS

Except for a few isolated cases where new settlers had neglected to use the appropriate BHC-fertilizer mixtures at planting time, damage by wireworms, *Lacon variabilis* Cand., was almost non-existent during the past year. Due to these BHC mixtures having a slight retarding effect on germination when placed too close to the setts there has been a tendency in some quarters to apply about half the quantity of BHC normally recommended. While this rate of treatment may be enough to prevent any serious damage during periods of low wireworm incidence it is insufficient to cope with dense populations, and an appreciable percentage of "misses" could occur in years favourable for wireworm increase. Experiments are in hand to ascertain whether the refined gamma BHC is likely to prove more satisfactory for this purpose, while aldrin and dieldrin are also being tested in respect of their insecticidal value against wireworms as well as for any phytotoxic effect on the germinating sett.

The funnel ant, *Aphaenogaster pythia*, continued to cause trouble in the Tully district and in the neighbouring section of the South Johnstone mill area by undermining cane stools and reducing yields in varying degree. It is probable that as a result of greater concentration on this pest, the area where damage is occurring has been found to extend to a few farms in the Mossman area, though its activities there are on a greatly reduced scale in comparison with the Tully infestations. Although a number of potent soil insecticides have been used none has so far achieved any observable degree of control by the methods of application employed. For the most part these have been used as drill dressings placed either above or below the sett at planting time or in the half-open drill some time after planting. The insecticides tested in these investigations included BHC used at the rate of 75 lb. of 20 per cent. dust (2.6 per cent. gamma isomer) per acre, chlordane and aldrin at rates of 2, 4, and 8 lb. per acre, and dieldrin at 2 lb. active ingredient per acre. Further experiments involving different methods of application are now in progress.

Localised damage which was apparent as a result of the association of "earth pearls," *Margarodes* sp., with cane roots at Qunaba prompted investigations being undertaken to obtain life history details, while attempts were also made to control these pests by means of

insecticides. The first emergence from the encysted form occurred in October and continued into January. The pink adult females formed small earthen cavities at depths of from four to eight inches, secreted a cottony lining and proceeded to lay eggs. Many of these eggs had hatched by early December and the minute encysted forms were seen to be present on the growing roots by the beginning of January. However, the activities of predaceous mites in the samples forwarded for laboratory studies prevented data being obtained on the duration of the egg stage and the habits of the first stage larva. The presence of some large encysted forms in February indicated a likely overlap in generations, thus rendering any form of cultural control more difficult. In an effort to control the pest by means of insecticides a number of exploratory trials were set out using gamma BHC and aldrin at rates of up to 4 lb. per acre spread evenly over the soil and disced in prior to planting, but it is not expected that any results will be forthcoming from these trials for at least a year.

Flights of the Dynastid, *Heteronychus sanctae-helena*, were particularly heavy around Brisbane in January, 1954, and it would appear that this pest has within recent years extended its range well into Queensland from northern New South Wales. Recent reports of serious damage by these beetles to plantings of fodder canes in parts of the South Coast dairying district focused attention on the likely threat by this pest to the commercial cane plantings in the adjacent Rocky Point mill area. A similar type of damage, i.e., gnawing and destruction of the young primary shoot, was recorded from the Maryborough district, but in this instance mole-crickets, *Gryllotalpa africana*, were responsible for the limited damage encountered.

No success was achieved in recovering the Encyrtid parasite, *Anagyrus saccharicola* Timb., which was imported from Hawaii with the object of bringing the pink sugar-cane mealybug, *Saccharicoccus sacchari* Ckll., under more effective biological control. Soon after the parasite's liberation in the Ormiston area, a plague of field mice was responsible for the disappearance of most of the medium to large sized mealy-bugs that were present on the cane there at that time. This destruction of the host at a critical period was doubtless responsible for the apparent failure of the parasite to become established.

ANIMAL AND BIRD PESTS

Damage by rats was not classed as serious except in some of the northern areas where the intrusion of creeks and pockets of rain forest or swamp flora provide suitable breeding centres adjacent to the cane fields. However, baiting with packeted, thallium-coated wheat and phosphorus paste on bread effectively prevented any enlarging of the trouble spots.

Wallabies, *Wallabia agilis* Gould, caused considerable loss in the Mackay area where drought conditions in their natural haunts during the spring months forced them to invade the cultivated areas where the young cane shoots provided food. £644 was paid out as bonuses for 4,175 scalps collected in that district but this number was below the average for the previous seven years.

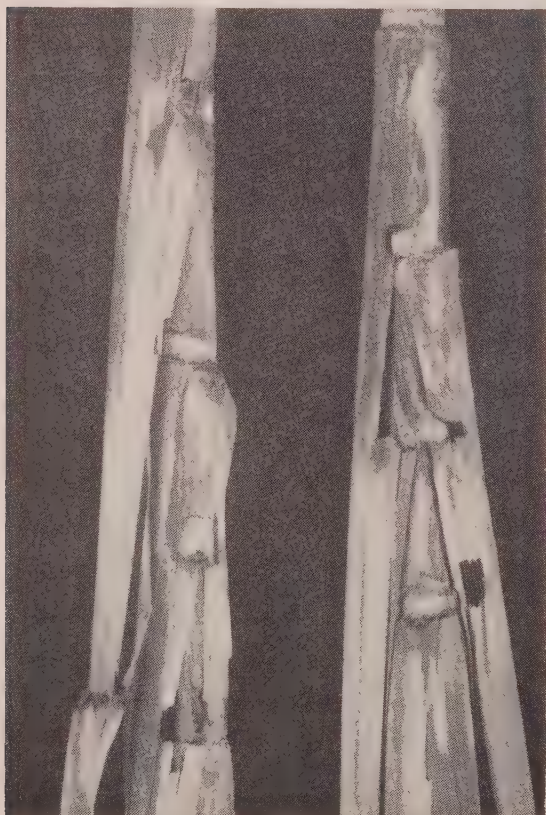


Fig. 50.

"Windows" in leaf sheaths of sugar cane made by mice seeking mealy bugs.

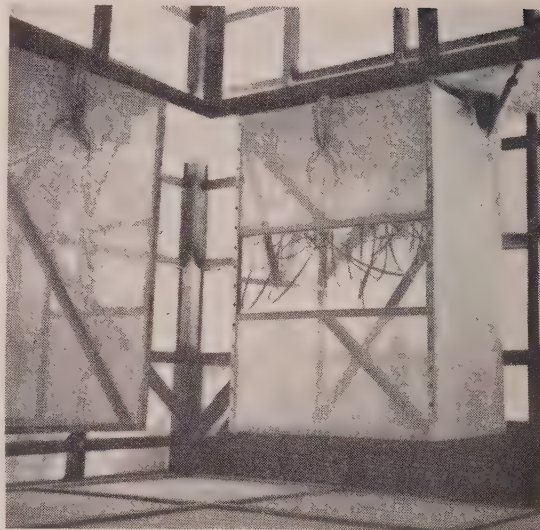


Fig. 51.

Voile cages inside insectary; these confine insects under investigation or prevent entrance of unwanted types.

Reports from districts further north stress the value of the beagle hound for ridding the cane areas of these pests, and over the years there has been a consistent reduction in damage in the Mossman, Mulgrave, Tully, and Burdekin areas as a result of the activities of these hounds. In the Proserpine district beagles have previously been killed by dingoes, but when these dogs have been crossed with the larger type of greyhound or with a similar type of hunting dog the resulting progeny have been able to defend themselves adequately and in addition have proved most effective in hunting and killing wallabies. The solution of the wallaby problem on farms fringing the forest areas appears to lie in a sufficient number of growers keeping beagles or beagle cross-bred dogs on their farms, and this opinion is finding wider acceptance as additional Cane Pest and Disease Control Boards sponsor the importation of these dogs into their areas.

It is felt that the provision of suitable cross-bred dogs in the southern cane-growing areas would likewise go a long way towards combating the fox pest which has assumed increasing



Fig. 52.

Disease transmission studies; germinating one-eye cuttings in the glasshouse.

importance because of the more extensive plantings of Q.50—a variety to which this animal is particularly partial. Baiting with highly lethal poisons would no doubt prove effective against foxes, but the attendant risks to domestic animals in any closely settled farming community cannot be regarded lightly and would preclude any large-scale adoption of this practice as a means of keeping the pest permanently subjugated. The organising of shooting drives also needs to be fostered by the payment of a lucrative bonus and it becomes increasingly evident that some action along these lines cannot long be delayed by the Cane Pest and Disease Control Boards operating in South Queensland.

A loss of 400 tons of cane at Mossman as a result of wild pigs was the highest recorded from any individual mill area during the year, but the larger number of scalps paid for in the Hambleton and South Johnstone areas did not reflect any corresponding increase in damage over that of the previous year.

Shining starlings, *Aplonis metallica*, which invaded a farm in the Silkwood area in the late

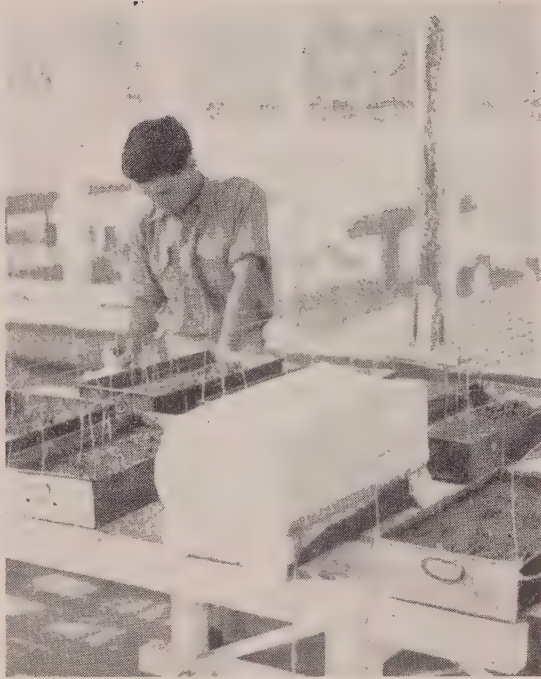


Fig. 53.

The germinated one-eye setts. These are used in investigations associated with disease transmission with insect vectors.

summer of 1953 and caused slight damage by resting on and breaking over the cane tops, returned in increased numbers during the past season. In this instance, however, they returned earlier in the season when the smaller cane was less able to support their weight and their damage was more spectacular. Attempts are to be made during the 1954 harvest to estimate the loss by weighing separate areas of damaged and undamaged cane from the same fields. Representations were made by some growers to have these birds included as pests under "The Sugar Experiment Stations Acts, 1900-1954," but this would have created some difficulty inasmuch as this bird is regarded as being beneficial in other areas, and because of this it is protected under "The Fauna Conservation Act of 1952." However this proposed action was considered unnecessary since ample provision exists under the latter Act for protected fauna to be taken under permit in places where they are causing damage.

Bald coots, *Porphyrio melanotus* caused an estimated loss of 250 tons of cane in the Burdekin, but elsewhere their depredations were not serious.

Disease Investigations

(C. G. Hughes, Senior Pathologist)

RATOON STUNTING DISEASE

Studies on ratoon stunting disease, in progress at the present time, fall into two fairly distinct categories; one, the application of known control measures on a commercial scale and two, investigational work on various aspects of the disease both in the field and in the laboratory.

The first attempt to control ratoon stunting by treatment with hot water on a field scale was made late in the planting season of 1952 when comparatively small amounts of cane were treated in the Burdekin and Bundaberg districts. The following season saw practically all Cane Pest and Disease Control Boards at least making a start, and the total treated throughout Queensland during the year amounted to approximately 2,115 tons. In some instances, e.g., Home Hill on the Burdekin, considerable acreages were planted with clean cane as a result of the two years' operations, and it was possible to transfer clean cane from this centre to other areas where no facilities existed for treatment with hot water or where difficulties were being experienced in treating immature cane for early planting.

During the 1953 season, sufficient evidence was accumulated to warrant the adoption of the two-hour treatment at 50°C. in preference to shorter treatments at higher temperature. This standard treatment gave reasonably satisfactory germinations with most varieties and, by analogy with experiments with Q.28, should have given control of the disease. There were many purely physical problems associated with the hot-water treatment of tons of cane setts: the temperature of the water about the individual sett had to be maintained evenly at the required temperature and, in addition, provision had to be made for the treatment of the setts with a mercurial fungicide before planting.

The problems were tackled realistically, and apparently satisfactory plants were set up by the Boards in conjunction with the mills, but it was not until critical examinations were made of the technique and the results obtained from the large plants, that the necessary degree of precision was appreciated. Many fields planted with treated setts showed some ratoon stunting and, in all cases, enquiries revealed that the setts had not all received the full treatment. Some tanks were found to possess cool areas through faulty circulation, others had been so overloaded that a satisfactory circulation was impossible, but in most instances the trouble could be traced to the packing of setts in bags (usually three-bushel cornsacks), the jute fabric of which prevented effective circulation within. Improvements effected included the use of iron and wire netting baskets instead of bags as containers for the setts, the installation of high-capacity circulation pumps, thermostatic operation of the heating units, whether steam or electricity, the use of long, brass-mounted, easily-read thermometers for testing temperatures in various parts of the tank and the installation of effective lifting machinery. Several of the tanks incorporate all these improvements and results from the setts treated in them will decide whether all present commercial canes can be rendered disease-free by this method.

Investigational work in the field has included the initiation of yield trials with standard commercial canes in every major cane district with the exception of the Herbert River area. A series was planted in 1953 and another this year, but harvest results are not yet to hand. Some of the trials do, however, show marked differences in growth between healthy and diseased cane. In several districts observational strip trials of healthy cane in blocks planted



Fig. 54.

First ratoons of Badila which had been heat treated before planting to observe the effect on ratoon stunting disease; the row on the left was treated for 40 minutes at 52°C and that on the right for 20 minutes at the same temperature.

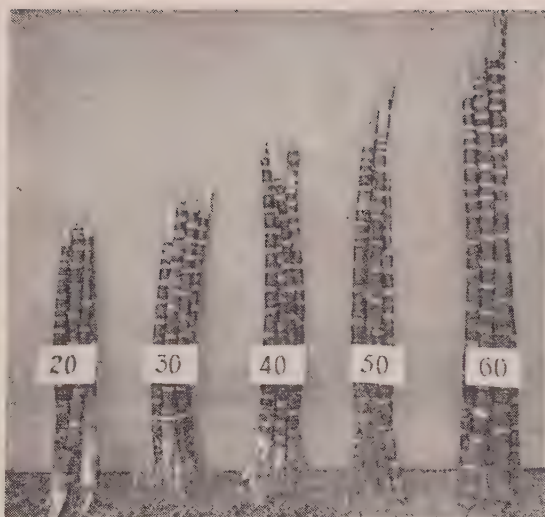


Fig. 55.

Average stalks taken from a time/temperature treatment trial against ratoon stunting disease. All treatments were in hot water at 52°C and at time of immersion ranged, left to right, from 20 to 60 minutes.



Fig. 56.

From the same trial depicted in Fig. 57. On the right is diseased Q.50 and on the left healthy Q.50. Average of all plots disclosed that the healthy cane gave four tons per acre more than the infected.



Fig. 57.

Result of a ratoon stunting disease trial in Bundaberg. Truck on left is loaded with a plot of healthy Pindar; that on right is a similar sized plot of diseased Pindar. All replications of the trial showed that the healthy cane outyielded the diseased by four tons per acre. The crop was eleven months old plant cane.



Fig. 58.

Another ratoon stunting disease trial—in Gordonvale district. The left hand truck contains a plot of diseased Trojan and that on the right a healthy plot. Difference in yield was twelve tons per acre. The crop was fifteen months old plant cane.



Fig. 59.

Second ratoons of a ratoon stunting disease resistance trial at Mackay. In the foreground can be seen adjacent rows of healthy and diseased varieties.

with setts from diseased sources have demonstrated clearly that many commercial or near commercial varieties, e.g., N.Co.310, Pindar, and Trojan, are affected even in the plant crop. The occurrence of internal symptoms in diseased cane has also received attention and several unexplained features have emerged. One of the most puzzling is why symptoms should be difficult to find in one district yet not in another although canes in both are diseased. The examination of numerous stools indicates that it is rare for a secondary or later shoot to show symptoms if the primary shoot does not and the advice is now given when searching for the disease in a block to examine the largest, i.e., the primary, shoots in the smaller stools.

The stage at which internal symptoms first show is of importance in determining whether diseased setts have been planted in particular instances, and whether plants arising from setts inoculated with suspect material are in fact diseased. Prior to the discovery of the discoloured bundles as a definite diagnostic symptom, it was usually necessary to wait as long as eighteen months, in some instances more than two years, and never less than twelve months, for a positive diagnosis of the disease. The use of internal symptoms has shortened the period considerably, but until recently it was the normal practice to wait until the cane was mature or nearly so before making the examination. Extensive sectioning of young material at Eight Mile Plains during the summer months of 1953 and 1954 has shown that, in the variety Q.28, symptoms, which take the form of a general pink colouration at the node, may be seen in plants arising from diseased setts as early as seven weeks after planting and at a time when the growing point is well below ground level. A similar feature is not seen in the young nodes of large cane, but can be seen in suckers from established stools and in young ratoons. The fact that young shoots showed the symptoms led to the initiation of an experiment in which growing cane was cut at various heights, several drops of diseased juice placed on the cut surface, and the subsequent young shoots examined for

symptoms. Two susceptible varieties, Q.28 and the seedling G.176, were tested in this way, but after several months the shoots which had arisen from the top three or four buds were all apparently normal. However the shoots were still only small and it is anticipated that the disease symptoms will develop later.

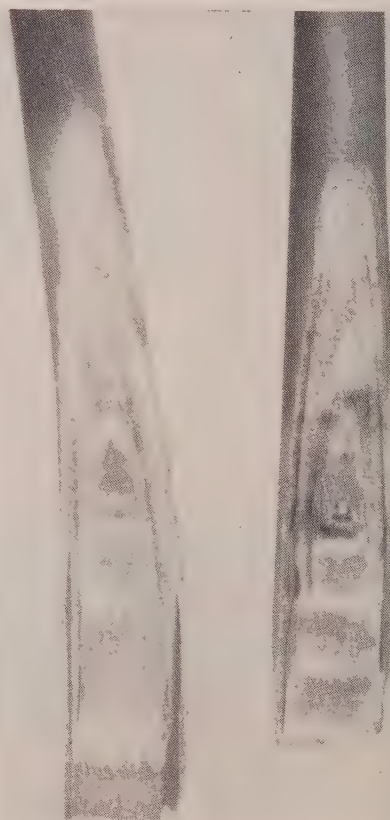


Fig. 60.

Discolouration of young nodes due to ratoon stunting disease. Left healthy; right diseased; variety Q.28.

Examination of plants from inoculated setts showed symptoms similar to those from diseased setts, but they did not show at such an early stage. Attempts to concentrate the virus by the use of the Sharples Super-Centrifuge and precipitation with ammonium sulphate at various strengths were not successful, but further work is to be undertaken using

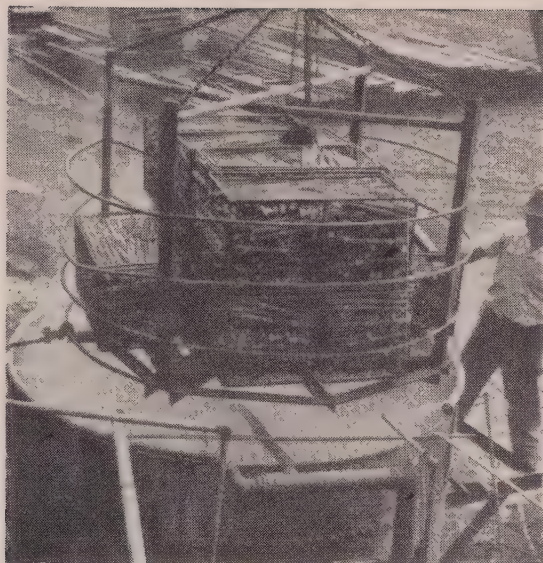


Fig. 61.

The commercial hot-water treatment of setts for the control of ratoon stunting disease. The wire baskets are being lowered into the tank.



Fig. 62.

A closer view of the treatment tank. The hot water, circulated by a centrifugal pump can be seen spurting from the spaced holes in the pipe.

the Grebmeier Ultra-Centrifuge which is adapted for the treatment of individual samples in tubes. Inoculation tests of diseased juice into a range of test plants, which included tomato, zinnia, tobacco, marrow, egg plant, *Emilia sonchifolia* and *Nicotiana glutinosa*, indicated that the causal agent of ratoon stunting was not the same as that of spotted wilt, cucumber mosaic, or tobacco mosaic. Results of inoculations with juice from plants affected with these diseases into cane setts are not yet to hand. Other work under way at Eight Mile Plains includes experiments on the following aspects of the disease: sterilisation of knives; killing of the causal agent by means of other chemicals added to the mercurial solutions used for the treatment of setts; possible alternative hosts; longevity of the virus in extracted juice; transmission by root inoculations; relative concentration of the virus in the leaves, stems, and roots; possibility of the existence of strains of the virus, and thermal death curves for the virus in extracted juice and in discs cut from diseased stalks.

The study of the time-temperature relationships of the virus in diseased setts has been

continued. The current planting is as yet too young for final figures, but information from the experiment planted in late 1952 is to hand. Treatments for this were carried out in cornsacks, but under accurate experimental conditions. The percentage infection in stools using 100 setts of Q.28 per treatment was as follows:—

Percentage Infection			Percentage Infection		
Treatment			Treatment		
49° C.	1½ hrs.	79	51° C.	1½ hrs.	5
	2 hrs.	10		2 hrs.	0
50° C.	1 hr.	11	52° C.	1 hr.	3
"	1½ hrs.	0		1½ hrs.	1
	2 hrs.	2	53° C.	¾ hr.	3
51° C.	1 hr.	6	"	1 hr.	0

The amount of disease developing in the plantings from setts treated at 49° C. for 1½ hours indicates how an inappreciable drop in temperature and comparatively small curtailment of time can lead to a virtually complete failure to control the disease. The occurrence of two per cent. disease in the treatment at the recommended 50° C. for two hours, which actually represented one diseased stool (owing to poor germination in this section of the plot) is a matter for comment. As mentioned above the treatment was carried out with the setts in bags and further tests in open metal containers are under way.

The ratoons of the ratoon stunting disease resistance trial planted in 1952 at Eight Mile Plains showed that several Bureau seedlings were susceptible to the disease, in that they showed losses in the inoculated plots in both plant and ratoon crops. On the other hand some canes showed no appreciable differences between the inoculated and the healthy controls. Commercial canes included were limited in number, but it was shown that Co.331 suffered no obvious losses while Vesta was of the same order of susceptibility as Q.28. The trial planted in 1952 at Mackay included a range of canes from Queensland as well as from other parts of the world. Many of these were subsequently found to have come from diseased or suspect sources and had to be disregarded, but the trial showed that



Fig. 63.

A hot-water treatment effect on a sett of Pindar immersed at 52°C for 90 minutes. The bud has produced a peg of uniform thickness before shoot-rooting and stooling started. Planted November 1952 and examined 12 months later.



Fig. 64.

The variety C.P. 36/13 showing effects of ratoon stunting disease in the second ratoon crop. Left healthy, right diseased.

the following varieties could be inoculated with the disease in the sett (as indicated by the discoloured bundles in the growing stalk) but not show any stunting in the subsequent plant or ratoon crops: C.P.29/116, C.P.36/183, D.166-34, P.O.J.2961, P.O.J.2967, P.O.J.3016, and Q.50, while M.112/34 and Q.58 showed considerable stunting, although not so serious as in Q.28, in the inoculated plots.

Since the disease was first recorded as widespread in Queensland in the spring of 1952 it has been under close observation in a wide variety of canes and conditions so that it is now possible to present in general terms the losses suffered by commercial canes with notes as to the development of internal symptoms. The list

in table given below includes all canes approved for growing in any Queensland mill area. The losses are compared with those to be expected for Q.28 under similar conditions, i.e., the disease will probably cause some depression in growth in

the plant crop but in the ratoons will have such an effect as to cause serious economic losses. The internal symptoms are also described in comparison to those in Q.28, which shows the discolouration as well as any variety examined.

Reaction of Approved Varieties to Ratoon Stunting Disease.

Variety	Yield Losses	Internal Symptoms
Atlas	—	—
Badila	moderate	variable.
Badila Seedling	—	variable.
B.208	—	variable but apparently disease-free stalks often show dark cream bundles.
C.P.29/116	small	often difficult to find, never very obvious
Cato	moderate to severe	—
Clark's Seedling	—	obvious.
Co.290	—	obvious.
Co.301	small	obvious.
Comus	probably small	variable, but apparently disease-free stalks often show dark cream bundles.
E.K.28	—	—
Eros	moderate	obvious.
M.1900 S.	severe	obvious.
N.Co.310	severe	obvious.
Pindar	small to moderate	obvious.
Pompey	—	—
P.O.J.213	—	—
P.O.J.2725	moderate to severe	variable.
P.O.J.2878	severe	—
Q.25	—	—
Q.28	severe	obvious.
Q.42	severe	obvious.
Q.44	small	often difficult to find.
Q.45	severe	obvious.
Q.47	moderate	variable.
Q.49	severe	obvious.
Q.50	Variable, severe S.Q. small, Central Q.	often difficult to find.
Q.51	severe	obvious.
Q.55	severe	obvious.
Q.57	—	—
Q.813	severe	often difficult to find.
Ragnar	—	—
S.J.2	severe	often difficult to find.
S.J.4	severe	variable.
S.J.16	severe	obvious.
Trojan	severe	obvious.
Vesta	severe	obvious.
Vidar	severe	obvious.

CHLOROTIC STREAK

Setts may be rendered free from chlorotic streak by treatment for 20 minutes in hot water at 50° C., or even several degrees lower under carefully controlled conditions, so it is obvious that the recommended treatment of 50° C. for two hours against ratoon stunting will also be effective against the other disease. There have been widespread plantings of this treated cane and even though some attempt was made to avoid localities known to be affected with chlorotic streak, since for obvious reasons the progeny from plantings in these

places would be allowed only limited distribution if any at all, some treated material was unfortunately put out in the low-lying areas typical of the chlorotic streak country in North Queensland. The amount of disease developing during the growth of the plant crop was sufficient justification for the general policy of avoidance of these areas, and demonstrated clearly the existence there of a fairly efficient means of spreading the disease.

The search for a possible vector is being maintained by the entomological staff working

from Meringa. In this connection, further experiments were carried out with a number of sap-sucking insects commonly associated with cane in North Queensland, but in addition to following additional ones were tested: *Neomas-* the seven mentioned in last year's report the *kellia bergii* Sign., *Aphis maidis* Fitch, a small green unidentified Jassid, and *Tetranychus* sp. In most cases these were maintained in cages with diseased and healthy cane for a sufficiently long period to allow one or more generations to be produced and to transfer freely between plants, after which they were killed and the healthy plants transferred to the field. These plants were then sprayed regularly to prevent further colonisation, but to date no case of secondary spread has been detected.

Previous reports have recorded the presence of chlorotic streak in the areas north of Townsville, at Proserpine in Central Queensland, and at Maryborough, Moreton, and Rocky Point in the south, but the important districts of Bunda-

berg and Mackay have been apparently free from the disease. This continues to remain true of Bundaberg, but at Mackay the disease was recorded for the first time. The fact that Proserpine, only 50 miles from the main Mackay area, has been known to be infected since 1937 has led to a close watch being kept on the latter district over a number of years and the occurrence of the disease in isolated areas in various parts of the Mackay district came as somewhat of a surprise. It was first found in December, 1953, on a farm at Plane Creek, the southernmost mill of the Mackay group, and subsequent inspections indicated that the disease was not at all widespread in that area. Later in the summer the disease was found on six farms on low-lying country near Baker's Creek in the Pleystowe area and on five farms in the North Eton and Marian areas. The survey for the disease is being continued and, in the meantime, restrictions are imposed on the use of plants from diseased farms unless the plants are subjected to hot-water treatment.

GERMINATION STUDIES

Germination trials were laid down at Gordonvale, near Cairns, at Ayr and at Brisbane during the winter of 1953. That at Gordonvale was designed to test phenyl mercuric acetate against "Aretan" (one of the standard preparations containing ethoxy ethyl mercury chloride) both in cold solutions at a strength of .015 per cent. mercury and in hot (50° C. for two hours) solutions at one-fifth that mercury content. The trial demonstrated clearly the necessity for a mercurial treatment, especially when the setts were subjected to the hot water, and also showed that there was little to choose between the two mercurials as a fungicide against the causal agent of pineapple disease *Ceratostomella paradoxa* (de Seynes) Dade). There were approximately 100 buds on three-eye setts, replicated five times for each treatment. Percentage shoot germinations under the harsh conditions of the trial were abnormally low but even so the stands provided by the mercurials were quite satisfactory by com-

mercial standards. Germinations at seven weeks after planting give an indication of the comparative results: hot water control 4 per cent., which was significantly less than the 28-35 per cent. of the hot mercurials; the cold control at 15 per cent. was also less than the 27-30 per cent. of the cold mercurials.

Trials in the Ayr District included a commercial preparation of 90 per cent. sodium pentachlorophenate ("Santobrite") as well as "Aretan" and phenyl mercuric acetate (P.M.A.). The mercurials were used at standard strength as a cold dip and the Santobrite, also in the cold, at concentrations from 0.1 to .005 per cent. Although the controls did not germinate as quickly as some of the treatments pineapple disease was not a factor in these uninoculated trials and no conclusions could be drawn as to the relative value of the various treatments,

The trials at Brisbane included one in which the setts were inoculated with pineapple disease and another in pineapple disease-free soil designed primarily to ascertain whether there was any stimulatory effect of the various compounds under test. Conditions were cold and dry and germination was very slow. In the inoculated trial, Aretan and P.M.A. gave a satisfactory germination but Santobrite, .005 and .05 per cent., "Ziram," sodium phenyl phenate, sodium trichlorophenate, and the sodium salt of 2,2 dihydroxy 5,5 dichloro diphenyl-methane did not control pineapple disease and consequently gave unsatisfactory germinations. No conclusions could be drawn from the uninoculated trial and a fair germination resulted in all plots. A third trial at Brisbane was in the nature of a small planting of setts treated with varying strengths of hot formalin solution to determine the effect of the formalin on germination, should it be found to be effective in delaying the biological deterioration of organic mercurials in solution. Results showed

that one in 10,000, 5,000, or 1,000 formaldehyde at 50° C. for two hours had no adverse effect on germination.

The development of a new type of cutter planter by E. Blundell, an inventor and cane farmer of Innisfail, North Queensland, would not normally warrant mention under a pathological heading except that it is equipped with a bath for holding a mercurial solution into which the newly cut setts fall before their transfer to the chute guiding them down into the furrow. The short dip is quite efficient for the control of pineapple disease, but the question arises as to whether the cutting of a stalk affected with, say, ratoon stunting, the virus of which can survive in a mercurial solution, will not infect the whole contents of the bath and so lead to the inoculation of setts cut afterwards. The question of antiseptics against ratoon stunting in such a bath and also in the tank of the returnable spray type of cutter planter, is under investigation.

LEAF SCALD DISEASE,

Bacterium albilineans (Ashby)

The leaf-scald trial planted at Eight Mile Plains in the spring of 1952 showed a reasonably satisfactory amount of disease, but the comparative lack of disease in the susceptible standard canes, H.Q.426 (Clark's Seedling), Oramboo, and Trojan, casts a doubt as to whether the canes showing a small amount of disease were resistant or had escaped infection by the sett-pressure method of inoculation employed. In an attempt to solve this problem 25 stools in the uninoculated control plots (none of which had developed the disease) were ratooned in early October and as each stick was cut (slightly higher than normal in order to avoid excessive soil in the inoculum) a drop of diseased juice was placed on the stubble tops. The inoculated stools were covered with trash for 24 hours in order to minimise the lethal effects of the sun's rays on the exposed bacteria. The ratoons came away well except for some which developed small wilted shoots

showing no external evidence of leaf scald. Isolations showed the causal bacterium to be present in these stools and it was concluded that the wilting was due to leaf scald. The amount of wilting varied from one variety to another and all shoots in a stool were always affected. These stools did not die and the majority grew out of the wilting although always remaining stunted in comparison with stools which, even while showing symptoms of leaf scald, had not wilted in the early stages. An inspection on 30th December, 1953, showed 96 per cent. diseased stools in H.Q.426, 64 per cent. in Oramboo, and 48 per cent. in Trojan and indicated that the ratooning with inoculation was a success. The ratoons continued to grow rapidly, and results from further counts in late February, taken in combination with the earlier figures, proved of considerable interest. The commercial canes N.Co.310, Q.28, Q.42, Q.47, Q.50, and Vesta did not show a single

diseased stool at either inspection, but some variations in amount of disease as between the two counts occurred in a number of cases. H.Q.426 and Oramboo recorded approximately the same number of diseased stools at each count, indicating a high degree of susceptibility, while the percentage in Trojan dropped from 48 to 4 per cent. Vidar maintained an infection of approximately 60 per cent. placing it in the

same order of susceptibility as the Oramboo while the variety Q.57 showed 84 per cent. at the first count and none at all in the second, indicating that Q.57 may not be any more susceptible than Trojan which is apparently not seriously affected in many northern localities where leaf scald is present, unless associated with a more susceptible variety, or neglected. The ratooning technique is to be tested further.

FIJI DISEASE

The fact that not a single stool affected with Fiji disease was found in the large Bundaberg district during 1953-1954 brings the ultimate eradication of the disease from all the cane fields of Queensland one stage nearer. The disease had last been found there in December, 1952, and these fields were ploughed out after harvest in 1953, leaving one field only which had a history of disease. This was a ten-acre block which in November, 1951, had yielded eight diseased stools and none since, and was to be ploughed out after harvest in 1954. In the Moreton area the 14 diseased stools rogued came from two blocks on the one farm and is the lowest recorded since control measures against the disease were first put into operation. At Rocky Point, the third area recorded as diseased within recent years, four blocks on three farms yielded a total of 40 diseased stools.

Figure 65 shows in graphical form the history of the control of Fiji in Queensland since the institution of Cane Pest and Disease Control Boards in 1938. Early figures for number of diseased stools rogued do not give the whole story since during those years a number of plough-out orders was issued on diseased fields and infection in them was not

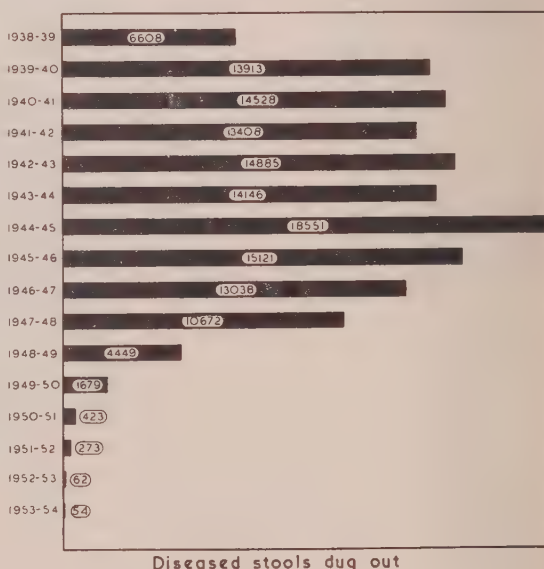


Fig. 65.

completely recorded. The decrease in number of diseased stools found does in all instances represent a true decrease since the inspection and roguing operations have always been maintained at the highest possible level with the sole aim of finding and destroying the disease.

MISCELLANEOUS

Although downy mildew disease (*Sclerospora sacchari* Miy.) does not now occur in any commercial cane plantings in Queensland, resistance trials for this disease are being continued at Eight Mile Plains. The trial planted in spring, 1953, included only advanced seedlings

and standard varieties of known reaction. One seedling, K.338, selected at the Mackay Station from the cross Co.419 x Q.34 (Badila x Q.813), was found to be the most susceptible cane ever tested here. Leaf infection was almost 100 per cent. and many stalks were killed by the

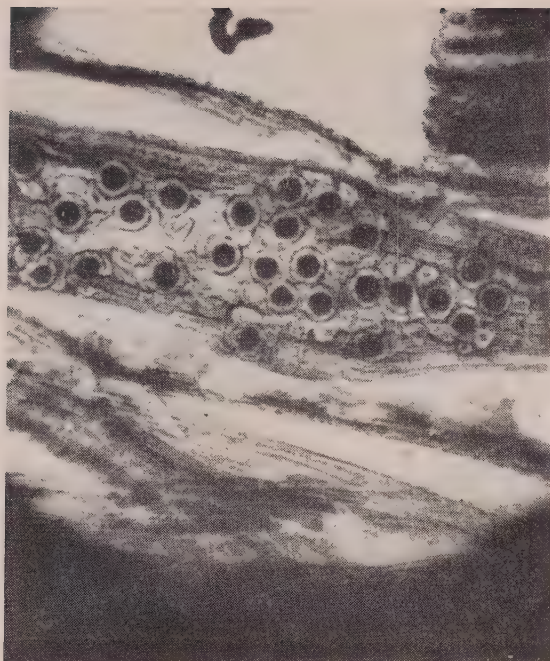


Fig. 66.

Photomicrograph of spores of Sclerospora in a leaf of cane.

from setts subjected to 16 hours in air at 53° C.

Sclerospora disease, the causal agent of which is apparently close to *Sclerospora macrospora*, was recorded for the first time in the Mackay district. It occurred in low-lying country subject to flooding and only a small number of stools were involved.

The first ratoons of two dwarf disease resistance trials which had been set out in similar low-lying portions of the Homebush area, were carefully examined during the year but infection in the standard variety, P.O.J. 2878, was so low (less than two per cent.) that it was not possible to draw any conclusions regarding the relative susceptibility or resistance of the other 28 varieties that were under test. However, a comparable low percentage of dwarf was found in the following seedling canes and commercial varieties: G.101, H.130, I.120, I.162, J.128, Q.45, Q.56, Q.58, P.O.J.2961, and P.O.J. 3016.

minutes none, while 78 per cent. were recorded disease. Its reaction was such that the variety could never have been grown as a commercial crop in the presence of the disease and indicated a new order of susceptibility even in comparison with the known susceptible canes, P.O.J.2878 and Trojan, in which at times the disease has been very difficult to control.

Reference to the action of hot mercurial solution on setts infected with downy mildew in overseas literature prompted the initiation of a preliminary test at Eight Mile Plains. There was only a comparatively small amount of diseased material available and the test was on a limited scale, but results were so clear-cut that further work is planned. The untreated control setts yielded 96 per cent. diseased shoots, the 1 in 200 Aretan cold 95 per cent. and the 1 in 200 Aretan at 52° C. for 30



Fig. 67.

Witches broom effect caused by Sclerospora disease in Q.50

The red rot *Physalospora tucumanensis* (Went) Speg.) trial at Eight Mile Plains planted in spring 1952 developed a satisfactory amount of red rot when left unharvested until December, 1953. The highly susceptible standard, Q.52, developed up to 40 per cent. death of the stalks in individual plots while there was also death and deterioration in Q.50. Q.28 and several seedlings showed marked resistance to deterioration and despite the ideal conditions for the disease remained quite sound.

A species of *Verticillium* previously reported as associated with poor ratooning and weak growth, was isolated from a further series of specimens from various part of the State. Usually the fungus was found confined to the outside of the stalk, although young shoots are regularly invaded, but at times it did penetrate the stalks especially when they were piped. A failure to germinate in setts treated against pineapple disease with mercurial solution at Childers, South Queensland, was traced to a rotting due to the fungus within the sett. The fungus isolated was found capable of attacking sound setts when inoculated by the cork-borer method. Inoculations into young ratoon stools have indicated that *Verticillium* is pathogenic, but studies on the temperature relationships of the fungus have established that it has a marked peak in growth rate at 27° C. to 31° C., surprisingly high figures for a possible pathogen acting in the cooler weather.

Miscellaneous items of pathological interest observed during the period under review include a sclerotial fungus affecting growth in parts of the Herbert River area and numerous instances of marked frecklings. Some of these are quite spectacular, e.g., that in Q.50 at Cloyne in the Gin Gin district, and while their etiology is obscure some at least appear to be genetical in origin. A non-fructifying fungus occurring in large lumps was ploughed up in an alluvial pocket in the Moreton area. Although of no apparent pathological significance it was of interest as being the first record of the occurrence of the so-called "blackfellow's bread" — a general term applied to this type of fungal body — in cultivated cane lands.



Fig. 68.

The collection of miscellaneous diseases in the "living museum" at the Bureau's Pathology Farm near Brisbane.

Velvet beans, which are steadily increasing in popularity as a green manure, were found affected with a fungal leaf spot in North Queensland and to a lesser extent in other districts. In some instances infection was sufficiently severe to reduce the ground cover and cause a premature cessation of growth. A *Cercopora* was found on the leaves. A more severe infection with another organism, as yet unidentified but possibly close to *Isariopsis* was recorded on mung bean in North Queensland during the early part of the wet season. Mung bean has shown promise as a legume for the wet areas in comparatively small plantings and the plantings made towards the end of 1953 were the first on an extensive scale. The crops made good early growth with the heavy rains of the early wet season and an excellent cover had formed when suddenly all leaves were shed and the crops died. The severity of the damage may have been a varietal reaction and, since the bean did show such promise for really wet situations, steps are being taken to obtain a range of varieties or strains for trial.

The usual legume inoculum service to cane farmers was continued and sufficient inoculum was supplied to treat 184 bushels of velvet beans, 465 of Poona peas, and 69 of mung beans.

QUARANTINE

Fifteen varieties were distributed from the Brisbane quarantine house after hot-air treatment at 54° C. for eight hours. Imported canes included C.P.33/409, C.P.48/103, C.I.41-142, E.P.C.38-304, F.31-436, F.31-962, F.36-819 and Lahaina (Hawaii) from the United States Department of Agriculture, while C.4-6, Krakatau, 45 M.Q. 3205, and U.S.48-34 were received from the Colonial Sugar Refining Company. The remaining three varieties were Queensland canes on transfer between quarantine districts. Distributions were made to the four Bureau Experiment Stations, the Beerwah isolation plot, the Redland Bay variety garden, and to the C.S.R. Company at Macknade, North Queensland, and Condong, New South Wales.

Varieties at present in the quarantine house include 51 B.N.15801, 51 B.N.15803, 51 B.N.15804, F.36-771, 45 M.Q. 2569, 40 S.N.746, 51-9002, 51-9011, 51-9035 and 51-9037 from the Colonial Sugar Refining Company, B.O.10, B.O.11, B.O.28, B.O.29, Co.313, Co. 513, Co.683, and Co.779 from India, B.45-151, B.47-44, and B.47-419 from Barbados, Azul, C.P.38/34, C.P.50/11, C.P.51/27, C.I.38-32, Lahaina (Java), Sumatra No. 2 and Tukuyu No. 2 from the United States Department of Agriculture, Co.285 and Co.312 from South Africa, E.1/37 from Mauritius and two varieties for transfer between Queensland quarantine districts. 51 B.N.15804, a Turkestan hybrid self, arrowed and set seed in the quarantine house. It was allowed to ripen and then despatched to Meringa for planting.

Mealy bugs *Saccharicoccus sacchari* (Ckll) have been a problem in the quarantine house for many years, but control has apparently been obtained this year by watering the soil in which the cane is growing with 0.5 per cent. "Systox" solution. Further tests are being carried out to determine minimum dosage rates.

A number of canes are growing in open quarantine in Brisbane. These include eight varieties forwarded by Mr. B. R. Heagney, a



Fig. 69.

Infected cane setts and corn are grown in the downy mildew disease resistance trial; these provide an ample supply of spores for infection of the canes under test.

former patrol officer, from highland areas in New Guinea. Four of them were replacements for varieties collected by the 1951 Bureau expedition but which failed to germinate when brought back here. Other canes in open quarantine include 26 from Fiji by courtesy of the Colonial Sugar Refining Company: five of these are *S. edule* varieties whose reputed susceptibility and tolerance to Fiji disease may make them of value in Fiji disease resistance trials, the others are prospective commercial or breeding canes.

Division of Mill Technology

Engineering Technology

(J. H. Nicklin, Chief Technologist (Engr.))

Electrical: Reports and suggestions covering electrical extensions were made to several factories. Very little argument is heard to-day against the use of turbines in the sugar industry and when additional generating plant is required this type of prime mover suggests itself immediately. The only real problems to be solved are what size of plant should be installed, what steam conditions should be specified and what steam consumption is desired at those conditions. It is also important to remember that a turbine ordered for certain steam conditions will not deliver its rated load if the steam pressure falls below or the back pressure rises above that specified.

Switchboard panels for controlling two turbo-generating sets are now being constructed in Brisbane. These panels were originally designed by the Bureau which is continuing to act in a supervisory capacity during construction.

Electrical matters were mainly discussed during visits to Inkerman and Millaquin. For both of these factories the 1953 season was, electrically speaking, somewhat of a milestone. At Inkerman the changeover of all electrical plant to standard frequency and voltage was completed, while at Millaquin alternating current was used for the first time. The Bureau had a particular interest in these changes and it is pleasing to record that operations for the first season were quite satisfactory.

An interesting application of electricity was investigated in connection with the heating of ratoon stunting disease treatment tanks. Steam is the usual medium adopted for this purpose and when a factory is crushing the cost is almost negligible. When treatment is required during the slack season, however, steam can be a rather expensive item. The alternative of electric energy was carefully considered at Tully and was eventually adopted. A number of high capacity heating elements is used and some idea of the power involved can be ob-

tained from the fact that the electrical demand of the tank would be more than sufficient to meet the lighting needs of Tully township.

Parallel Operation of Sugar Factory and Regional Board Electrical Systems: Interconnection with a Regional system enables a factory to dispose of surplus electric power when it is crushing. This results in a saving of fuel to the Regional Board and a part of this saving can be credited to the factory to offset the cost of the fairly large amount of power which must be imported during the slack and at crushing week-ends.

Interconnection wherever possible is supported by the State Electricity Commission and has always been strongly advocated by the Bureau. Unfortunately, however, there is no uniform policy covering the matter and the lack of such a policy prevents proper planning when sugar factory electrical extensions are being considered. Negotiations are left entirely to the individual Boards and under such an arrangement changes in personnel can cause difficulties. Such a difficulty arose recently when it appeared that certain factories would not be allowed to parallel at any time with the Regional system. In an endeavour to prevent this rather drastic step, which would be extremely inconvenient to the factories con-

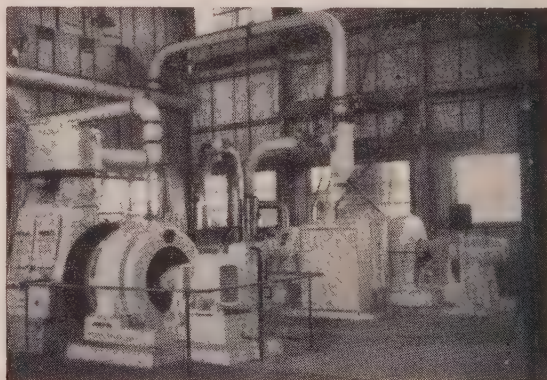


Fig. 70.
The alternator and new turbine at Millaquin mill.

cerned, an interview was arranged with the State Electricity Commissioner. Subsequent action by Mr. Neil Smith enabled avoidance of any immediate trouble and his help is much appreciated. Discussions are still proceeding with the Commissioner and it is hoped that a guiding policy for the whole State will eventually be formulated.

Boiler Investigations : At the start of the season a week was spent at a northern factory where surplus bagasse was proving rather an expensive nuisance yet the steam supply was poor. The crux of the problem was lack of draught and a considerable improvement was effected by re-arranging dampers so as to make better use of the draught which was available. Later in the season, after a larger fan motor had been installed, a good steam supply was maintained and surplus bagasse ceased to be a nuisance.

Some observations on combustion efficiency were made on a number of boilers. These observations tended to confirm previous tests which showed that with step grates it is nearly always necessary to restrict the "top" air as much as possible in order to obtain reasonable combustion efficiency.

Condenser Tests: Tests were carried out on two pan condensers. Originally the two condensers were identical and of the Webre type, but at the time of the tests one had been altered to a simple tray type. Both units were found to perform quite well with the tray type

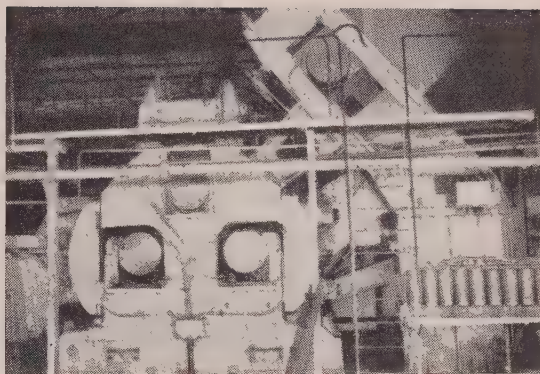


Fig. 72.

New 84in. mill and crusher feeder installed at Babinda mill. The automatic juice sampler may be seen at the right.

slightly more economical as regards water consumption.

Milling Tests: During the course of the milling tests at Babinda measurements were made of the driving horsepower required. These measurements showed very clearly the large effect which mill settings have on power requirements.

Mill Effluent Problem: To avoid contamination of mill effluent with fly ash a scheme for the pneumatic collection of this material from the boiler chambers with suction provided by a steam jet ejector, was submitted to a southern factory. The results obtained should be of general interest to the industry.

New Plant Items of Interest: The turbine drive on the last mill at South Johnstone continues to give every satisfaction. Two more units of similar type will be installed in the near future to provide the increased power which is necessary to hold the extraction figure in spite of a considerable increase in the crushing rate. Several other factories also have turbines on order for mill drives and it is probable that from now on all new milling plant will be equipped with these compact prime movers. The South Johnstone unit is shown in Fig. 73.

The 2000kW, turbo-alternator at Inkerman, which is probably the largest low voltage generating set in Australia, was put into operation in 1953 and had a successful run for its first season. Two more sets of this capacity are now on order for other factories. Heavy

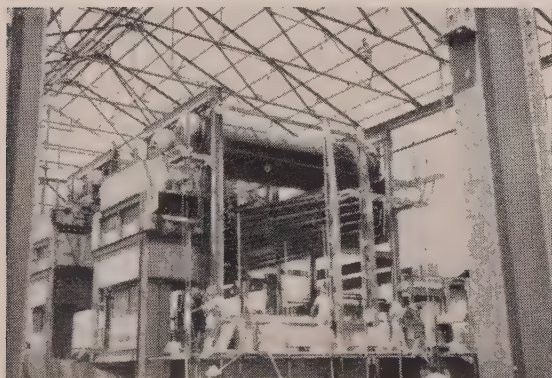


Fig. 71.

New boiler during erection at Millaquin mill, showing economiser section.

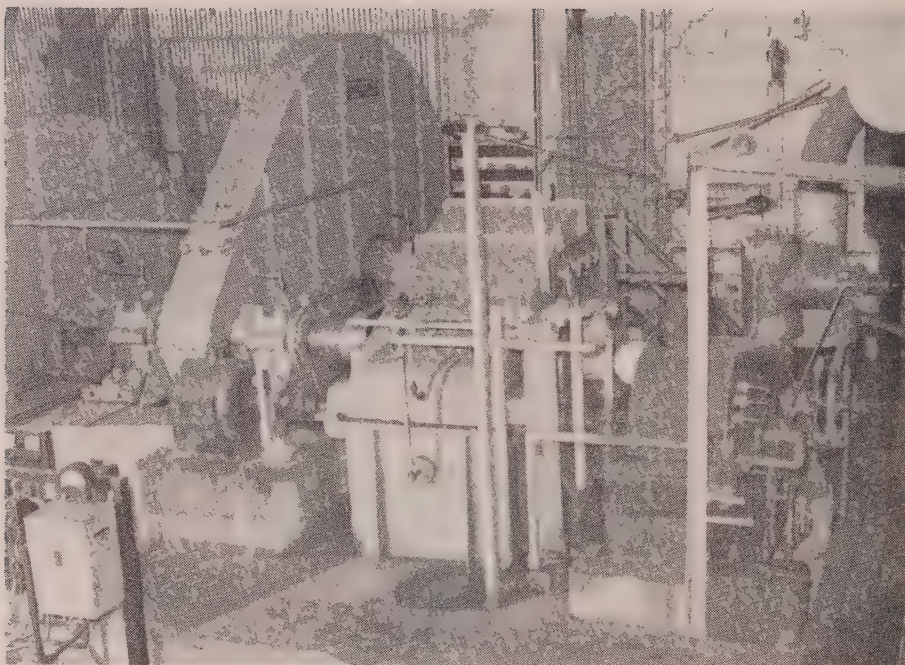


Fig. 73.

Above: The first turbine to be installed in Queensland for a mill drive.

Centre: The high rupturing capacity air circuit breakers at Pleystowe.

Below: The separate bagasse store at Pleystowe showing forward and return conveyor belts.

fault currents are possible with these large machines and all circuit breakers and fuses used on main switchboards should have adequate rupturing capacity. In this connection it is interesting to note that high rupturing capacity air circuit breakers, which previously were only available from abroad, are now being manufactured by three firms in Australia. The extension to the main switchboard at Pleystowe, which is equipped with this type of breaker, is shown in Fig. 74.

Another "first" for Queensland is the separate bagasse storage house which was put into operation at Pleystowe. From Fig. 75 it will be seen that the bagasse store is situated some distance from the boiler house and that rubber belt conveyors for storage and return bagasse are the only connections between the two. With this arrangement bagasse handling is a part time job for only one man.



Fig. 74.



Fig. 75.

Chemical Technology

(J. L. Clayton, Chief Mill Technologist)

Laboratory Operations.—The demand for testing of apparatus and equipment during the year was appreciably heavier than usual. Tests were carried out on 308 brix spindles, 66 flasks, 26 pipettes, 59 polariscope tubes, 11 thermometers and 5 standard quartz plates. In addition, three new polariscopes were checked and two others overhauled, two refractometers were serviced, two balances adjusted and one set of weights calibrated. The technology laboratory of the Bureau is now registered with the National Association of Testing Authorities and authorised to issue N.A.T.A. certificates for testing in certain phases of metrology and chemical analysis.

Milling Tests.—A further series of milling tests was carried out on the first mill and pressure feeder unit at Babinda mill. It was unfortunate that the top roller of the mill became unserviceable early in the tests and had

to be replaced by a roller not properly suited to the position. As a result the performance of the unit at the time was mediocre, but it has been demonstrated since then that the mill and pressure feeder are capable of yielding extractions of over 80 per cent. at 120 tons of cane per hour. An attempt was made to determine the extraction of the pressure feeder by measuring the juice flowing from the rollers. However, the juice was so contaminated with dirt and pieces of cane, and the flow so variable that the project was abandoned. As in the case of the previous tests, there was no indication that the c.c.s. values were significantly modified by the analysis of first expressed juice coming from a two-roller “crusher” instead of the usual three-roller mill.

In conjunction with the milling investigation, tests were carried out on cane prepared to

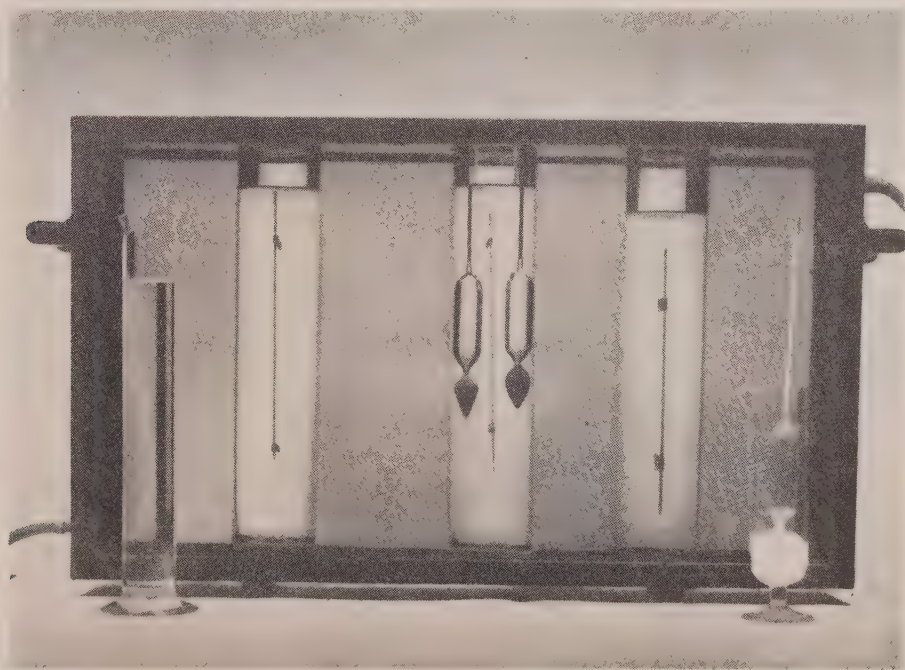


Fig. 76.

Brix spindles are tested by comparison with a certified spindle in the equipment shown.

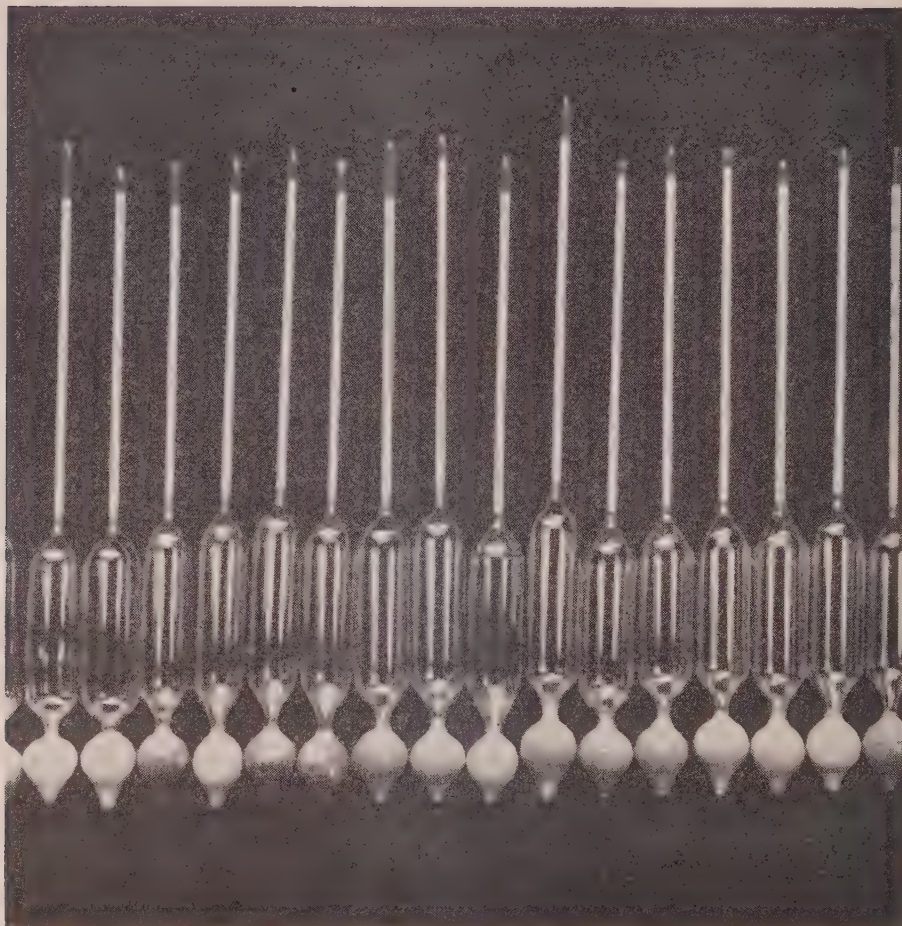


Fig. 77.

A row of brix hydrometers laid out ready for testing; up to 500 spindles are tested each year.

various degrees and compressed in a cylinder with a perforated bottom. By these means it was established that the familiar assumption of equality of brix from cell to cell within the cane is unsound, there being a significant decline of brix with increasing degree of extraction of juice. The effect was less marked as the degree of preparation was increased, and when fibrated cane was tested the brix of the expressed juice declined more rapidly than the corresponding brix, but there was a pronounced tendency for the purity to pass through a maximum value before declining to the lowest level at the limit of the extraction. With the press operating at practically a constant upper limit of

pressure the increase in extraction associated with finer preparation was quite conspicuous.

Wax Extraction Plant.—A few tests were carried out on the wax extraction unit set up at Bundaberg, but generally the operation of the unit has proved unsatisfactory. Extractions of 75 to 90 per cent. of the wax in the mud were achieved, with solvent ratios in the range of 3.6 to 5.5 parts of solvent per unit of filter cake. This plant is in process of being dismantled and will be replaced by equipment in which it is hoped to test both the batch extraction of wax from air-dried mud and the extraction of wax from a slurry of mud and water. Preliminary tests have shown that it

is very difficult to carry out the continuous liquid-liquid extraction of wax from mud on a small scale owing to the difficulty of passing mud successfully through small orifices. However, the chief purpose in setting up the pilot plant will be to acquire a few fundamental data required for the design of a larger unit.

Active Magnesia in Mud Filtration.—

Extensive tests were carried out on a laboratory scale to determine the effect of active magnesia for the treatment of primary muds prior to filtration. Both a suction leaf filter and a filter press were used. It was found that satisfactory coagulation of the mud was brought about by the addition of 0.75 per cent. of active magnesia with subsequent heating to 85°C. In all cases the addition of the magnesia was found to raise the purity of the filtrates, the average difference in purity between filtrates from treated and untreated muds being two units. Under the conditions applying to continuous rotary filtration the treatment with active magnesia showed minor points of advantage, particularly in the lower yield of cloudy filtrate, but the benefits were not sufficient to justify advocacy of the practice. On the other hand the benefits of the magnesia treatment in association with press filtration were spectacular and clearly warranted further study. An attempt was made to conduct a test on a factory filter press at Maryborough Sugar Factory. As on a previous occasion when a comparatively large quantity of magnesium oxide was involved, the test was a failure as the oxide was not properly calcined. It cannot be doubted for a moment that magnesia can be calcined properly on an industrial scale, but so far no satisfactory type of kiln has been located.

Defecation Tests.—A few tests were carried out in the laboratory to determine the effect of the synthetic polyelectrolytes Lytron X886 and Krilium on the flocculation and settling of muds in the defecation process. On the juices available at the time a wide range of proportions of the materials mentioned was found to have no measurable effect on the muds. Tests carried out by other investigators in a different sugar area indicated that the addition of Lytron

was responsible for improved rates of settling of muds. There is a suggestion that the different results are associated with different soil types — a point which is to be studied during the 1954 season.

Pan Tests.—A new coil pan built to specifications drawn up by the Bureau was installed at Mulgrave mill late in the 1952 season and was reported to be performing very unsatisfactorily. Arrangements were made for Bureau officers to test the pan early in the 1953 season but just before the visit the internal baffling of the condenser was altered. This may have altered the operating conditions, as the pan was found to behave quite normally. One disturbance during the tests was traced to faulty operation of the rotary vacuum pump. The pan was used for the boiling of B massecuites which were built up from footing to finished massecuite at rates exceeding 1000 gallons per hour with steam pressures not above five pounds per square inch.

Miscellaneous.—Arguments have been conducted on an International level as to the relative merits of wet lead and dry lead for the clarification of sugar solutions for polarization.



Fig. 78.

A view of the air-conditioned juice laboratory and polariscope room at Maryborough factory. In the foreground is the cooling bath in which samples are chilled quickly before entering the laboratory in which the temperature is maintained close to 20°C.

It is common practice in Queensland, where there are many saccharimeters fitted with the Herzfeld Schonrock scale, to adopt a false normal weight of 26g. for the testing of sugars and to clarify with wet lead. A series of carefully conducted tests showed that the compensation of errors is not exact but quite adequate, particularly when it is recognised that the saccharimeter itself may have a scale error up to 0.1 scale degrees.

Bureau officers visited all mills during the year and gave advice on many problems associated with the expansion programme and factory operations in general. The second Refresher Course for mill chemists was conducted in Brisbane early in 1953 and was well received.

THE 1953 SEASON

The most outstanding feature of the 1953 season was that, not only was the production a record, but also the yield of sugar rose for the first time above one million tons — in fact it came close to the one and a quarter million mark. Nearly nine million tons of cane were milled and crushing rates were high in all



Fig. 79.

Technologists inspecting part of the Roberts fugals station at Victoria mill.



Fig. 80.

The sugar drier at Babinda mill.



Fig. 81.

A row of vacuum pans at Babinda mill. The two outer pans are modern coil pans of 7,500 gallons capacity; the centre one is a 6,000 gallons Webre pan.

areas. The average crushing rate of 87.15 tons of cane per hour was nearly nine units above the previous highest. In the years 1944 to 1947 the average crushing rate of the mills was fairly steady at about 60 tons per hour. The rise of over 27 tons per hour since that time gives a good indication of the extensive increases which have been made in the equipment throughout every factory. The season involved a total of 5515 crop days, but with a few exceptions the individual mill seasons were lengthy without being unduly prolonged. In 1950 the crop days were 6469, but conditions in that year were extreme. Low losses of time both for manufacture and cane supply in 1953

assisted greatly in keeping the length of the season within reasonable bounds.

Despite many increases in plant most mills worked at above comfortable capacity during the year and there was a slight decline in the general level of mill efficiency. The pol extraction averaged 94.81 per cent., which is below the reasonable level for Queensland, and it may be accepted that mill engineers in the State will not be content until extractions of the order of 96 per cent. are being achieved.

At present many mills in Queensland are seriously limited in roller speeds. Gear ratios in excess of 20 to 1 from engine to roller are common, so that, with engines limited to about 60 r.p.m., the maximum peripheral speed of the rollers is below 30ft. per min. At the new crushing rates many mills are working on an excessively thick blanket of bagasse and the quality of the work done is not easily maintained at a high standard. With the extraction on the decline milling practices in Queensland are being reviewed more critically than ever before, and already the first steps have been taken to abandon some of the old-established practices peculiar to this part of the world in favour of the desirable features of overseas technique.

By a coincidence the overall recovery of pol in the factories was exactly the same as in the 1952 season — 85.45 per cent. — but the purity of the raw material was slightly higher in 1953. In view of the appreciable increase in production rate the position is considered to be very satisfactory. However, it is disturbing to note the slight increase in the true purity of final molasses, particularly as the expected purity of the molasses was slightly lower than in 1952. Irrespective of the technical merits of the Douwes Dekker formula for determining an expected purity for final molasses, its introduction into the Queensland

factory control system has been responsible for substantial improvement in the recovery of sugar from the molasses in recent years. It would appear that the increased crushing rates are again exceeding the handling capacity of the low grade treatment plants. In 1953 the average purity of the molasses was just over four units above the expected purity.

The quality of the sugar produced in 1953 was abnormally high, the polarization averaging nearly 98.9. Some easing of the penalty associated with the marketing of sugar over 99 pol is doubtless responsible for the high average value achieved and it is to be hoped that these conditions will be maintained. The benefits of high polarization in the drying of raw sugars and their subsequent storage are so pronounced that it is to be hoped that the present standard of sugar quality can be maintained.

It is to be noted in the Tables that during the season the mills consumed nearly 17,000 tons of wood as extra fuel, together with 700 tons of coal and some 1200 tons of molasses. The low consumption of molasses gives an indication of the demand for this material for other purposes. The use of substantial quantities of extraneous fuel appears to be difficult to eliminate; the ironical part is that a mill may be forced to consume added fuel for a few weeks of the season, and be seriously embarrassed for the remainder of the season by a surplus of bagasse. For some years now the need for added fuel has been associated with circumstances of a temporary nature. The added fuel amounts to less than one per cent. of the total fired and does not represent a serious drain on the economy of the industry.

The 1953 season may be viewed with general satisfaction. The target of production has been achieved, and with less damage to efficiency than was generally anticipated,

Table X.

Production Data for Queensland Mills for Seasons 1947-1953.
(Totals and Weighted Averages)

Northern District	1947	1948	1949	1950	1951	1952	1953
Cane—							
Tons	1,876,137	2,478,083	2,426,929	2,622,402	2,135,564	3,092,819	3,315,716
Pol per cent.	14.81	15.55	15.50	14.40	15.64	14.84	15.45
Fibre per cent.	10.62	10.55	10.58	10.35	11.26	11.24	11.61
C.C.S.	13.66	14.39	14.36	13.21	14.58	13.70	14.68
Purity 1st Expressed Juice	88.60	89.24	89.17	87.81	90.08	88.47	89.96
Sugar—							
Tons 94 net titre	255,958	356,959	345,684	344,944	304,786	421,921	467,716
Cane per ton sugar	7.33	6.94	7.02	7.60	7.01	7.40	7.09
Pol per cent.	98.48	98.60	98.42	98.47	98.52	98.66	98.81
Net titre	96.91	97.24	96.99	97.12	97.07	97.33	97.52
Dilution indicator	33.0	30.0	30.0	29.0	28.8	31.3	31.0
Pol per cent. pol cane	84.89	86.60	84.59	85.29	85.39	86.61	85.78
Mud—							
Tons	33,152	37,485	42,450	46,765	38,342	53,197	55,582
Mud per cent. cane	2.85	2.67	3.12	3.10	3.13	2.91	2.95
Pol per cent.	3.41	3.93	3.59	3.66	4.10	4.50	3.55
Pol per cent. pol cane	.66	.67	.72	.79	.82	.90	.69
Molasses—							
Gallons (1000's)	5,066	6,087	6,143	6,737	4,950	7,905	7,723
Gallons per ton cane	4.36	4.33	4.51	4.48	4.04	4.32	4.17
Brix	86.74	86.40	86.57	86.36	88.82	88.28	89.87
Apparent purity	32.41	33.01	34.15	30.93	33.78	31.66	33.97
True purity	—	46.47	47.78	44.73	45.57	43.36	45.71
Expected purity	—	—	—	—	38.36	37.99	38.90
Reducing sugars	17.50	18.28	17.96	20.97	17.59	18.87	16.07
Pol per cent. pol cane	5.35	5.23	5.68	5.36	4.86	5.90	5.62
Final Bagasse—							
Tons	258,536	308,282	308,622	335,620	295,620	429,961	446,918
Bagasse per cent. cane	22.34	21.93	22.68	22.26	24.14	23.48	24.24
Pol per cent.	2.45	2.86	3.12	3.04	3.09	2.97	3.03
Dry substance	51.04	51.70	50.70	50.49	51.33	52.30	51.63
Pol per cent. pol cane	3.68	4.04	4.75	4.70	4.77	4.64	4.73
Undetermined loss—							
Pol per cent. pol cane	5.42	3.46	4.26	3.86	4.16	1.95	3.18
Fuels—							
Tons: Wood	7,389	5,378	5,702	8,768	3,847	5,175	5,181
Coal	16	—	—	—	—	—	—
Molasses	9,057	10,691	8,436	16,691	6,577	5,951	1,206

* The figures for tons of cane, tons of sugar and tons of cane per ton of sugar refer to all mills. All other figures exclude C.S.R. Co. Mills and Rocky Point.

Central District	1947	1948	1949	1950	1951	1952	1953
Cane—							
Tons	1,380,368	2,572,089	2,691,364	2,580,013	1,971,468	2,685,687	3,773,830
Pol per cent.	16.44	15.98	15.41	14.96	16.44	15.95	16.02
Fibre per cent.	12.16	12.67	12.10	12.68	13.35	12.56	12.85
C.C.S.	15.36	14.76	14.11	13.93	15.28	14.80	14.92
Purity first expressed juice	90.59	88.85	87.59	89.60	89.66	89.56	88.82
Sugar—							
Tons 94 net titre	204,780	373,003	375,654	355,751	286,416	388,343	547,648
Cane per ton sugar	6.74	6.90	7.16	7.25	6.88	7.02	6.89
Pol per cent.	98.91	98.83	98.96	98.74	98.52	98.82	98.96
Net titre	97.57	97.62	97.91	97.25	96.81	97.37	97.71
Dilution indicator	30.0	28.0	33.0	29.0	28.2	30.0	29.5
Pol per cent. pol cane	85.94	86.46	86.27	86.73	84.12	86.46	86.24
Mud—							
Tons	49,767	83,008	86,934	81,414	64,799	81,139	133,893
Mud per cent. cane	3.61	3.23	3.23	3.15	3.49	3.33	3.49
Pol per cent.	1.88	2.27	2.67	2.67	3.36	3.21	2.95
Pol per cent. pol cane	.41	.46	.56	.55	.71	.57	.66
Molasses—							
Gallons (1,000's)	6,777	13,828	15,378	10,681	9,649	12,573	18,690
Gallons per tone cane	4.91	5.38	5.72	4.14	4.89	4.68	4.95
Brix	88.32	88.83	88.73	88.57	90.33	90.45	89.75
Apparent purity	37.69	35.40	34.11	36.17	35.35	34.50	34.62
True purity	—	46.56	45.40	45.74	45.01	44.01	44.60
Expected purity	—	—	—	—	40.64	40.80	39.81
Reducing sugars	14.57	17.30	19.97	16.19	16.49	16.09	18.22
Pol per cent. pol cane	6.51	7.05	7.37	5.73	5.96	5.92	6.14
Final Bagasse—							
Tons	344,687	657,839	697,490	668,330	552,250	695,837	1,010,347
Bagasse per cent. cane	24.97	25.58	25.91	25.89	27.34	25.91	27.01
Pol per cent.	2.62	2.58	2.67	2.37	2.71	2.60	3.07
Dry substance	52.14	52.99	50.99	51.48	51.71	52.40	51.96
Pol per cent. pol cane	3.97	4.12	4.49	4.04	4.60	4.19	5.11
Undetermined Loss—							
Pol per cent. pol cane	3.17	1.91	1.31	2.95	4.61	2.86	1.85
Fuels—							
Tons: Wood	4,988	9,315	8,576	10,140	5,084	3,822	6,985
Coal	271	244	743	528	225	233	181
Molasses	0	40	98	18	—	—	—

* 1947-1949 fuel figures exclude Pioneer and Inkerman.

Southern District	1947	1948	1949	1950	1951	1952	1953
Cane—							
Tons	894,482	1,383,884	1,399,749	1,489,291	898,140	1,063,030	1,661,517
Pol per cent.	14.31	14.58	14.07	13.50	14.07	13.21	13.82
Fibre per cent.	14.68	14.23	14.80	14.96	14.56	14.19	13.52
C.C.S.	13.01	13.28	12.83	12.32	12.69	11.90	12.52
Purity first expressed juice ..	88.05	86.95	87.10	87.10	85.76	85.40	85.90
Sugar—							
Tons 94 net titre	110,920	180,077	175,929	179,149	113,140	124,350	205,019
Cane per ton sugar	8.07	7.68	7.96	8.31	7.94	8.55	8.10
Pol per cent.	99.06	99.10	98.90	98.80	98.80	98.94	98.90
Net titre	96.96	97.96	97.08	97.33	97.24	97.55	97.51
Dilution indicator	25.0	28.0	33.0	34.0	28.6	31.5	29.6
Pol per cent. pol cane	83.86	85.04	85.34	85.32	85.61	84.62	85.03
Mud—							
Tons	30,515	40,951	42,957	52,451	35,971	37,451	57,018
Mud per cent. cane	3.39	3.10	3.09	3.66	4.02	3.56	3.47
Pol per cent.	2.55	3.10	2.99	2.53	2.42	2.70	2.67
Pol per cent. pol cane	.61	.65	.66	.69	.70	.72	.67
Molasses—							
Gallons (1,000's)	4,506	7,242	6,826	6,744	4,445	5,232	7,678
Gallons per ton cane	5.13	5.25	4.88	4.53	4.97	4.97	4.67
Brix	88.58	89.47	89.16	90.75	91.27	91.77	91.71
Apparent purity	38.70	37.40	38.48	37.60	33.84	34.44	32.75
True purity	—	46.39	46.80	45.57	43.72	43.24	41.74
Expected purity	—	—	—	—	40.56	41.09	40.4
Reducing sugars	13.05	15.35	13.95	14.68	17.81	17.08	19.10
Pol per cent. pol cane	7.85	7.93	7.85	7.55	6.92	7.98	6.54
Final Bagasse—							
Tons	257,705	397,317	416,113	437,610	275,890	317,961	477,531
Bagasse per cent. cane	29.22	29.02	30.22	30.56	30.85	30.23	29.17
Pol	1.94	2.02	1.95	1.95	2.19	2.10	2.46
Dry substance	51.07	51.98	52.01	51.40	50.47	49.87	49.46
Pol per cent. pol cane	3.87	4.01	4.20	4.42	4.83	4.75	5.19
Undetermined Loss—							
Pol per cent. pol cane	3.81	2.37	1.95	2.02	1.94	1.93	2.57
Fuels—							
Tons: Wood	4,421	5,925	5,558	3,870	4,306	3,493	4,774
Coal	513	77	88	351	642	511	519
Molasses	—	—	—	—	—	—	—

Mt. Bauple excluded from all except tons cane, tons sugar and tons cane per ton sugar in 1950 and from all figures in following years.

All Queensland Districts	1947	1948	1949	1950	1951	1952	1953
Cane—							
Tons	4,150,987	6,433,556	6,518,042	6,691,706	5,005,172	6,841,536	8,751,063
Pol per cent.	15.34	15.51	15.09	14.52	15.68	15.07	15.38
Fibre per cent.	12.28	12.51	12.41	12.52	12.99	12.44	12.69
C.C.S.	14.18	14.28	13.85	13.40	14.50	13.90	14.37
Purity first expressed juice ..	89.26	88.47	87.86	88.43	88.93	88.21	88.45
Sugar—							
Tons 94 net titre	571,658	910,049	897,267	879,844	704,342	934,614	1,220,383
Cane per ton sugar	7.26	7.07	7.26	7.61	7.11	7.32	7.17
Pol per cent.	98.81	98.83	98.81	98.68	98.58	98.78	98.91
Net titre	97.50	97.60	97.75	97.22	96.97	97.38	97.61
Dilution Indicator	30.0	29.0	31.0	30.0	28.4	30.5	29.9
Pol per cent. pol cane	85.11	86.16	85.62	86.00	84.79	86.21	85.88
Mud—							
Tons	113,434	161,444	171,981	180,630	139,112	171,787	246,493
Mud per cent. cane	3.31	3.02	3.17	3.27	3.36	3.23	3.36
Pol per cent.	2.51	2.86	2.97	2.88	3.32	3.56	3.02
Pol per cent. pol cane	.54	.56	.62	.65	.74	.70	.67
Molasses—							
Gallons (1,000's)	16,349	27,158	28,356	24,162	19,044	25,710	34,091
Gallons per ton cane	4.78	5.07	5.22	4.33	4.66	4.62	4.69
Brix	87.91	88.46	88.30	88.55	90.20	90.04	90.22
Apparent purity	36.35	35.40	35.17	35.10	34.59	33.61	34.05
True purity	—	46.49	46.22	45.36	44.83	43.32	44.20
Expected purity	—	—	—	—	39.92	39.90	39.7
Reducing sugars	15.17	16.95	17.84	17.19	17.15	17.21	17.93
Pol per cent. pol cane	6.45	6.78	7.05	6.07	5.82	6.25	6.09
Final bagasse—							
Tons	860,928	1,363,438	1,422,225	1,441,560	1,123,760	1,443,759	1,934,796
Bagasse per cent. cane	25.16	25.50	26.20	26.11	27.15	25.93	27.03
Pol	2.36	2.48	2.56	2.40	2.68	2.60	2.91
Dry substance	51.49	52.41	51.25	51.23	51.31	51.82	51.35
Pol per cent. pol cane	3.85	4.07	4.49	4.31	4.69	4.43	5.03
Undetermined loss—							
Pol per cent. pol cane	4.05	2.43	2.22	2.97	3.96	2.41	2.53
Fuels—							
Tons: Wood	16,798	20,618	19,836	22,778	13,237	12,562	16,940
Coal	800	321	1,150	879	867	744	700
Molasses	9,057	10,731	8,534	16,709	6,577	5,951	1,206

Tons of cane, tons of sugar and tons of cane per ton of sugar include all mills. All other figures exclude C.S.R.

• Mills only, except —

From 1950, Fuel figures include Pioneer and Inkerman. Mt. Bauple is excluded from all except tons cane, tons sugar and tons cane per ton of sugar in 1950, and from all figures in following years.

Table XI.
Tons of Cane per Ton 94 Net Titre Sugar, 1944-1953.

Season	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953
Tons Cane per ton 94 N.T. Sugar	6.83	7.06	7.25	7.26	7.07	7.26	7.61	7.11	7.32	7.17

Table XII.
Figures for 1953 Season (Totals and Arithmetic Averages).

	Northern	Central	Southern	All Districts
Tons Cane Crushed	3,315,716	3,773,830	1,661,517	8,751,063
Tons 94 N.T. Sugar made	467,716	547,648	205,019	1,220,383
Net Titre of Sugar	97.52	97.71	97.51	97.61
Tons Cane per ton 94 N.T. Sugar	7.09	6.89	8.10	7.17
C.C.S. of Cane	14.45	14.89	12.51	14.06
Coefficient of Work	95.99	96.87	98.19	97.07
Coefficient of Work E.S.G.	95.50	96.56	97.84	96.71
Crushing Rate	99.60	90.81	72.33	87.15
Lost Time per cent. Available Time	7.19	6.17	8.30	7.06
Fibre of Cane	11.62	12.78	13.69	12.80
Pol of Cane	15.48	16.12	13.82	15.26
First Expressed Juice—				
Brix	20.66	22.06	19.79	21.04
Purity	89.99	88.80	85.86	88.17
Purity—				
Clarified Juice	89.47	87.44	85.47	87.30
Syrup	87.86	87.68	85.61	87.09
Dilution per cent. First Expressed Juice	26.62	32.77	34.23	31.80
Final Bagasse—				
Pol	3.03	3.11	2.57	2.93
Dry Substance	51.91	51.90	50.06	51.34
Pol Extraction	95.24	94.79	94.52	94.81
Reduced Extraction	94.83	94.91	95.10	94.95
Final Molasses—				
Gallons per ton Cane	4.17	4.95	4.67	4.69
Brix	89.83	89.64	90.92	90.08
Apparent Purity	34.24	34.58	32.88	33.98
True Purity	46.02	44.71	41.83	44.14
Expected Purity	38.9	39.8	40.4	39.7
Reducing Sugars	16.16	18.00	18.86	17.84
Final Mud—				
Per cent. Cane	2.95	3.49	3.47	3.36
Pol per cent. Mud	3.78	3.38	2.89	3.32
Sugar—				
Pol	98.80	98.97	98.84	98.89
Reducing Sugars	0.33	0.26	0.25	0.28
Ash	0.19	0.20	0.22	0.20
Moisture	0.29	0.24	0.26	0.26
Dilution Indicator	31	30	30	30
Pol Balance—				
Sugar (Recovery)	85.59	85.88	84.71	85.45
Bagasse Loss	4.76	5.19	5.49	5.18
Molasses Loss	5.82	6.18	7.14	6.39
Mud Loss	0.69	0.68	0.71	0.69
Undetermined Loss	3.14	2.07	1.95	2.29
Boiling House Efficiency	94.11	95.06	95.94	95.11
Boiling House Efficiency E.S.G.	93.73	94.75	95.59	94.77
Fuels (as equivalent Bagasse per cent. Cane)—				
Wood	0.56	0.36	0.95	0.59
Coal	0.00	0.02	0.08	0.03
Molasses	0.11	0.00	0.00	0.03
Total added	0.67	0.38	1.03	0.65
Bagasse	25.41	28.33	29.31	27.96
Total Fuel	26.08	28.71	30.34	28.61
Crop Days	1,832	2,259	1,425	5,515

Table XIII.
Sugar Produced in Districts, 1953 Season, with Peak Allocations.

Districts							Tons 94 Net Titre Sugar			Production per cent. Peak
							Produced	Peak	Excess Production over Peak	
Northern	..	..	..	..	..	..	467,716	464,500	+3,216	100.69
Central	..	..	..	..	..	..	547,648	480,000	+67,648	114.09
Southern	..	..	..	..	..	..	205,019	208,000	-2,981	98.57
All Districts	..	..	..	..	..	..	1,220,383	1,152,500	+67,883	105.89

Table XIV.
Cane Milled and Sugar Yielded, 1953 Season.

Mills							Tons Cane Crushed	*Tons 94 n.t. Sugar made	Tons Cane per ton Sugar	
									1953	1952
Mossman	..	..	..	..	..	..	200,835	28,104	7.146	7.286
Hambledon	..	..	..	..	..	..	321,452	46,544	6.906	6.994
Mulgrave	..	..	..	..	..	..	323,768	46,835	6.913	7.017
Babinda	..	..	..	..	..	..	311,231	41,932	7.422	7.527
Goondi	..	..	..	..	..	..	270,082	36,483	7.403	7.626
South Johnstone	..	..	..	..	..	..	379,065	53,550	7.079	7.449
Mourilyan	..	..	..	..	..	..	239,376	32,896	7.277	7.436
Tully	..	..	..	..	..	..	399,182	54,758	7.290	7.648
Victoria	..	..	..	..	..	..	513,015	75,294	6.813	7.000
Macknade	..	..	..	..	..	..	357,710	51,320	6.970	7.364
Northern District Totals and Averages	..	..	..	..	..	..	3,315,716	467,716	7.089	7.401
Invicta	..	..	..	..	..	..	152,862	21,999	6.949	6.792
Pioneer	..	..	..	..	..	..	337,835	50,297	6.717	6.710
Kalamia	..	..	..	..	..	..	360,441	54,307	6.637	6.625
Inkerman	..	..	..	..	..	..	455,449	66,880	6.810	6.937
Proserpine	..	..	..	..	..	..	383,555	53,342	7.190	7.146
Cattle Creek	..	..	..	..	..	..	150,274	21,766	6.904	7.034
Racecourse	..	..	..	..	..	..	348,453	49,776	7.000	7.001
Farleigh	..	..	..	..	..	..	346,241	48,878	7.084	6.968
North Eton	..	..	..	..	..	..	180,187	25,867	6.966	7.071
Marian	..	..	..	..	..	..	323,426	48,021	6.735	7.096
Pleystowe	..	..	..	..	..	..	361,931	52,961	6.834	6.908
Plane Creek	..	..	..	..	..	..	373,176	53,554	6.968	6.986
Central District Totals and Averages	..	..	..	..	..	..	3,773,830	547,648	6.891	7.020
Qunaba	..	..	..	..	..	..	137,535	16,124	8.530	9.008
Millaquin	..	..	..	..	..	..	300,975	38,343	7.850	8.257
Bingera	..	..	..	..	..	..	308,622	37,977	8.127	8.617
Fairymead	..	..	..	..	..	..	285,950	34,115	8.382	8.653
Gin Gin	..	..	..	..	..	..	91,236	10,513	8.678	9.455
Isis	..	..	..	..	..	..	292,836	36,920	7.932	8.608
Maryborough	..	..	..	..	..	..	94,682	11,895	7.960	7.959
Moreton	..	..	..	..	..	..	132,361	17,198	7.696	8.384
Rocky Point	..	..	..	..	..	..	17,320	1,934	8.956	10.475
Southern District Totals and Averages	..	..	..	..	..	..	1,661,517	205,019	8.104	8.549
All Districts Totals and Averages	..	..	..	..	..	..	8,751,063	1,220,383	7.171	7.320

* Local Sales included.

Table XV

*Average Performance of Queensland Mills, excluding C.S.R. and Rocky Point Mills, 1952-1953 Seasons
(Arithmetic Averages)*

	Northern		Central		Southern		All Districts	
	1952	1953	1952	1953	1952	1953	1952	1953
Cane—								
Pol	14.92	15.48	15.97	16.12	13.26	13.82	14.89	15.26
Fibre	11.31	11.62	12.75	12.78	14.27	13.69	12.88	12.80
Purities—								
First expressed juice	88.56	89.99	89.55	88.80	85.44	85.86	88.06	88.17
Clarified juice	88.51	89.47	87.92	87.44	84.87	85.47	87.12	87.30
Syrup	88.11	87.86	88.11	87.68	84.83	85.61	87.15	87.09
Molasses—								
Gallons per ton cane	4.41	4.17	4.75	4.95	5.04	4.67	4.76	4.69
Apparent purity	31.91	34.24	34.46	34.58	34.47	32.88	33.88	33.98
Recovery overall	86.45	85.59	86.11	85.88	83.71	84.71	85.45	85.45
Recovery overall E.S.G.	86.09	85.28	85.79	85.60	83.41	84.41	85.12	85.16
Recovery on mixed juice	90.67	89.87	90.03	90.59	88.21	89.62	89.61	90.13
Recovery on mixed juice E.S.G.	90.28	89.54	89.69	90.30	87.88	89.30	89.27	89.82
Boiling House efficiency	95.64	94.11	94.44	95.06	94.66	95.94	94.78	95.11
Boiling House efficiency E.S.G.	95.23	93.73	94.08	94.75	94.31	95.59	94.41	94.77
Pol extraction	95.34	95.24	95.65	94.79	94.89	94.52	95.35	94.81
Reduced extraction	94.77	94.83	95.72	94.91	95.62	95.10	95.47	94.95
C.C.S.	13.59	14.45	14.81	14.89	11.91	12.51	13.69	14.06
Coefficient of work	98.24	95.99	97.32	96.87	97.30	98.19	97.53	97.07
Coefficient of work E.S.G.	93.28	95.50	92.66	96.56	92.55	97.84	92.68	96.71

Table XVI.

Analysis of Gross Time, 1953 Season, Excluding C.S.R. and Rocky Point Mills

	Total Hours	Per Cent. Gross Total Hours	Per Cent. of Available Hours
Crushing Time	80,914.20	71.92	93.05
Lost Time—			
Manufacture	3,767.81	3.35	4.33
Cane Supply	2,280.04	2.02	2.62
Total Available Hours	86,962.05	77.29	100.00
Premeditated and Week-end Stops	25,546.55	22.71	—
Gross Total Hours	112,508.60	100.00	—

Table XVII

*Average Crushing Rates, 1944-1953, excluding C.S.R. and Rocky Point Mills
(Arithmetic Averages)*

	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953
Total Crop Days ..	4,749	4,872	3,740	4,289	5,708	5,593	6,469	4,089	5,046	5,515

Total Crop Days, All Mills, 1944-1953

	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953
Tons Cane per hour	57.33	59.32	59.48	60.55	66.33	68.74	72.35	71.47	78.28	87.15

Table XVIII
Fuels Calculated as Equivalent Bagasse Per Cent. Cane, 1944-1953.
(Arithmetic Averages)

Year	Wood	Coal, etc.	Molasses	Total Added	Bagasse	Total Fuel
Northern District						
1944	1.063	—	1.770	2.833	22.633	25.466
1945	1.830	—	1.552	3.382	23.021	26.403
1946	2.287	—	1.088	3.375	22.858	26.233
1947	1.167	.005	.913	2.085	22.988	25.073
1948	.672	—	1.535	2.207	23.063	25.270
1949	.726	—	1.102	1.828	23.242	25.070
1950	1.050	—	1.878	2.928	24.468	27.396
1951	.598	—	1.220	1.818	27.169	28.987
1952	.598	—	.640	1.238	27.413	28.651
1953	.562	—	.111	.673	25.413	26.086
Central District						
1944	1.995	.131	.180	2.306	27.061	29.367
1945	1.372	.092	.326	1.790	28.144	29.934
1946	2.730	.132	.132	2.994	25.183	28.177
1947	1.487	.025	.019	1.531	28.068	29.599
1948	1.617	.037	.002	1.656	28.497	30.153
1949	.899	.153	.005	1.057	27.397	28.454
1950	.763	.053	.001	.817	29.731	30.548
1951	.564	.028	—	.592	32.369	32.961
1952	.331	.029	—	.360	30.507	30.867
1953	.359	.018	—	.377	28.334	28.711
Southern District						
1944	4.306	.151	—	4.457	29.326	33.783
1945	3.565	.059	—	3.624	30.550	34.174
1946	5.693	.697	—	6.390	29.341	35.731
1947	3.785	.141	—	3.926	30.388	34.314
1948	1.977	.009	.012	1.998	31.010	33.008
1949	1.633	.016	—	1.649	32.138	33.787
1950	.694	.060	—	.754	35.285	36.039
1951	1.362	.164	—	1.526	34.485	36.011
1952	1.160	.110	—	1.270	33.614	34.884
1953	.956	.078	—	1.034	29.309	30.343
All Queensland Districts						
1944	2.603	.107	.497	3.207	26.814	30.021
1945	2.218	.058	.524	2.800	27.781	30.581
1946	3.516	.270	.341	4.127	25.842	29.969
1947	2.238	.062	.226	2.526	27.684	30.210
1948	1.519	.018	.374	1.911	28.098	30.009
1949	1.122	.067	.266	1.455	28.106	29.561
1950	.808	.043	.434	1.285	30.225	31.510
1951	.818	.063	.282	1.163	31.820	32.983
1952	.648	.047	.148	.843	30.748	31.591
1953	.589	.032	.026	.647	27.960	28.607

